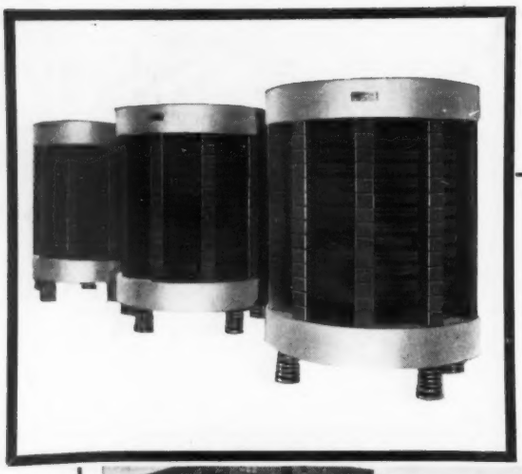
ELECTRICAL WORLD

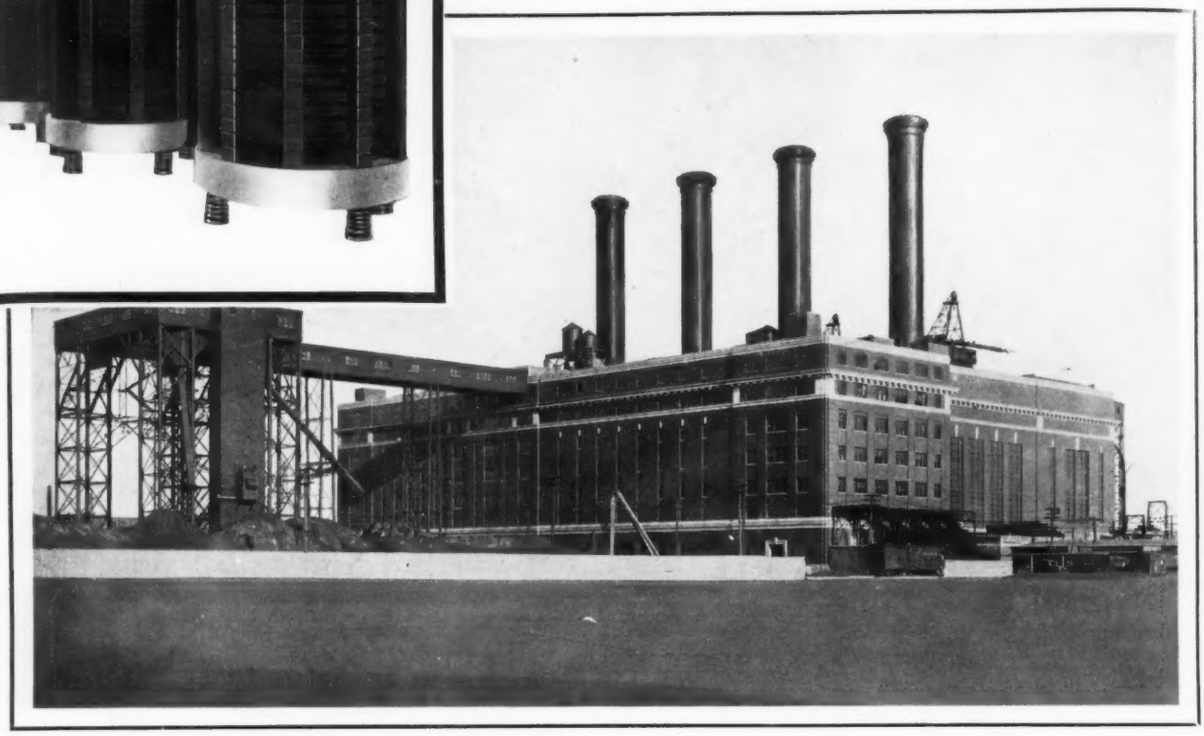
McGRAW-HILL PUBLISHING COMPANY, INC., NEW YORK CITY. ONE DOLLAR PER COPY

MARCH 30, 1935

Herein are presented facts and figures in behalf of the electrical industry directed to legislators, industrialists and other leaders of national thought and action in a constructive endeavor to show the competency of the industry to stimulate business recovery if it receives the friendly support and encouragement of the public and the government.

NATIONAL RECOVERY NUMBER





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NEW ENGLAND POWER ASSOCIATION and its subsidiaries constitute a public service enterprise in which individuals, institutions, insurance companies, savings banks—75,000 in all—are participants through the investment of $330,000,000.

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On December 31, 1934, the system had forty-seven generating plants — twenty-eight hydro and nineteen steam — with a combined water wheel and steam turbine capacity of 1,054,700 horsepower and a generator capacity of 753,430 kilowatts. The system had 2,067 miles of transmission line and 40,900 miles of distribution wire, carrying electric service to 486,803 customers. Retail subsidiaries also supplied 130,787 gas customers.

Directly affiliated with this system are the operating companies of the Massachusetts Utilities Associates, which on December 31, 1934 had 247 miles of transmission line and 17,700 miles of distribution wire, and served 109,840 electric and 58,699 gas customers.

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MARCH 30, 1935

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Recovery Through Private Initiative

IF ENCOURAGED, instead of destroyed, the public utilities can, with the help of other branches of the industry, create now a business of $16,500,000,000, employ 1,000,000 men and add $1,000,000,000 a year to payrolls. These estimates for a two-year recovery program have been visualized by the industry since last January and are outlined in this issue. Today this program cannot be carried out.

The investment markets which should supply the needed funds for expansion are congealed with the chaos of reconstruction and reform. Investors are acutely aware of the proposed Wheeler-Rayburn bills. If they are passed in their initial form, those responsible will create a market débâcle.

Investors know of the federal yardsticks, of the P.W.A. utility bills, of the incessant propaganda and distortion that emanate from enemies of private ownership.

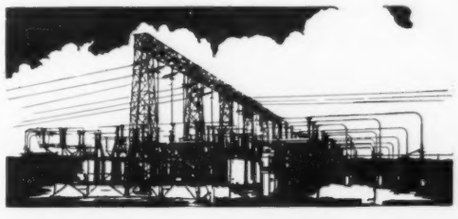
All these effects have been cumulative, successive parts of a planned campaign. They make impossible any attempt of the electric industry to raise the private capital necessary for a recovery program.

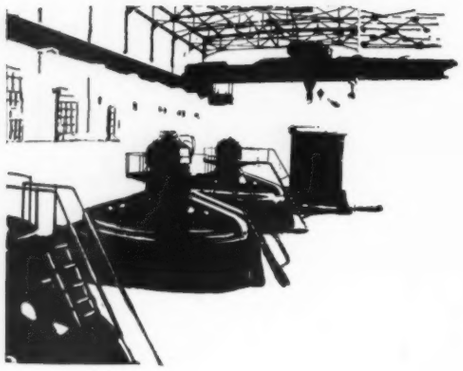
So long as the enemies of the utility industry wear the cloak of the present administration and disguise themselves and their purposes in the cloth of recovery and reform, there can be no progress.

Life-long agitators for public ownership and political exploiters appear to have been given the power of life and death over this electrical industry. They seek their own ends, not the public interest. They attempt the destruction of an industry whose past record merits approbation, not condemnation.

This industry is trained, organized and ready to carry out a recovery program that has been planned for months. It was ready in January to go ahead without asking for a dollar of government money, government subsidies or the creation of new government bureaus. What happened? A recovery program is now impossible. Led to expect a yardstick, the industry was faced with subsidized government competition. Expecting and welcoming sane regulation, it is faced by strangulation and destruction. It is fighting for its life instead of striving for recovery. Executives who should be directing the forces of expansion are kept busy putting out fires.

This treatment is not deserved. No one condones the abuses and bad practices that brought disrepute upon the entire industry as the result of the conduct of





a few exploiters that have blackened the name of the industry. Most of the bad practices and abuses have been corrected. The industry welcomes fair and rigid regulation to prevent their recurrence.

We challenge comparison with any industry that has grown to such magnitude in so short a time and contributed so greatly to national welfare. THERE IS LITTLE TO BE ASHAMED OF AND MUCH TO BE PROUD OF IN THE RECORD OF THIS INDUSTRY. It is eager to continue its advance, and fair treatment will enable it to carry on.

Private ownership under regulation is challenged and threatened by political opportunists and advocates of government ownership. This is the true background for actions by members of the Administration. These enemies of the industry would destroy, not regulate.

This industry is used to regulation and welcomes it. It is co-operating in carrying out the new securities act. It is co-operating with the states in their new, more drastic and more rigid utility regulation. It would co-operate in the development of fair federal regulation. But it will not supinely permit the destruction of its foundations nor admit that government ownership is in the public interest. It will no longer silently submit to undeserved punishment. These attacks are based upon enmity and self-interest that would use regulation as a means to blast it into oblivion.

This industry has no fear of fair competition. It has confidence in its ability to match and surpass any fair yardstick measurements. But subsidized federal projects ignoring cost accounting are blue sky yardsticks—the froth that supports distortion and propaganda. These yardsticks are uneconomic and uncalled for. Their chief purpose is to undermine public confidence in the industry and to hamstring it so that it cannot go forward.

The people of this country have the right to decide whether they wish to have private or government ownership of utilities. But this question is not submitted to them openly. It is disguised in harlequinesque robes of reform, recovery, relief and yardstick stitched together with legal phrases and colored with the glow of propaganda.

Public ownership cannot bring recovery, cannot conduct the light and power business successfully and cannot build the national power supply that this country needs and will get under private enterprise.

The opponents of private enterprise dare not submit to the public for its decision, their proposal stripped to its naked truth. The case of private enterprise is too sound.

A rapidly growing industry with technical and commercial problems needs the ingenuity, initiative and profit motivation that go with private enterprise. The $12,200,000,000 invested in private utilities today must be doubled and trebled in the near future to serve the American public properly. Present equipments and practices may and will change rapidly by reason of new developments.

The utility business needs and should use the money of investors put to work under regulated private management. This money should not be added to the national debt or be spent by a bureaucracy. The public needs and will benefit from

private management that knows the utility business, that is desirous of creating, that strives to improve and expand so that both management and public will benefit.

The utility business needs men who are trained and experienced. Any engineering group can build dams, power houses, lines. But the co-ordination of construction, sales, operation, finance, rate making, accounting and maintenance, like other activities needed in power supply, is a specialized task in management and employee performance. It is not a task for politicians or political appointees who come and go.

OUR PRIVATE UTILITIES KNOW HOW TO BUILD, HOW TO SELL, HOW TO OPERATE—THEIR RECORD PROVES IT. Their grids were copied by the British Grid. Their sales accomplishments serve as examples for utilities in all parts of the world. These things did not happen of themselves. They came through private initiative and private management. Does the American public believe that public ownership would staff utilities with managers and employees who would meet these specifications?

We present the facts about the utility business and the electrical industry in this number. We believe the facts support our opinions and conclusions. These facts will clear up misunderstanding, will tell the story of a tremendous feat. We have tried to reduce a complex industry to simple business terms. We have told the story of men who built the industry. We give a history and a perspective.

This constructive contribution is needed. We hope it will sweep away the clouds that threaten the industry. We are sincere in our belief in the industry and militant in our defense of it. We hope this number helps to bring out into the open the enemies of the utilities so that their true purpose will no longer be disguised in New Deal sophistry.

We do more than present a case for the industry. We show what it can do to stimulate national recovery. Electricity penetrates into all industry and into all activities. In a two-year program it could create a $16,500,000,000 volume of business and put 1,000,000 people to work. It could contribute to the economic readjustment of this country. It could advance living standards.

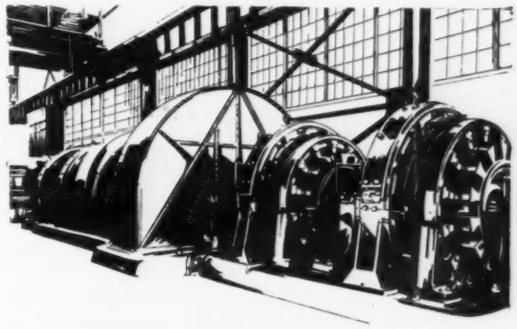
The things this industry can do now emphasize the positive assertion that present attacks and proposed punitive legislation are not in the public interest. This program is real, these facts are solid.

Read this number and weigh it against the unceasing attacks that are made upon the industry. Here are the facts to form decisions as to whether this industry should and can carry out its program if given a square deal.

This issue was conceived as a service to the industry and is directed to an audience outside the industry. We are glad some of the many units of the industry state their own opinions in our advertising pages as frankly as we are stating our own opinions here.

We have a selfish interest in the future of this business. We have served it for fifty-two years. As it prospers, we prosper.

We hope that this Recovery Number will aid the industry as a whole to overcome its present severe handicaps and make possible the carrying out of its recovery program with the friendly support of the public and the government.



This Business

A retail business dealing with 25,000,000 customers 24 hours every day

$1,837,000,000 yearly gross return to pay employees, suppliers and investors

$12,900,000,000 actually invested by 3,000,000 persons in power plants, transmission and distribution lines, substations, warehouses and offices

Even the smallest customer has a capital investment of $300 unknowingly behind his service

Investors loaned and management spent $960,000,000 in 1930 and $170,000,000 in 1934, of which 85 per cent went into the pockets of American workingmen

THE light and power industry as it stands today is the product of the skill and the labor of untold thousands of men paid for by the thrift of American citizens. The harnessed waterfalls, gigantic steam power plants, laced together with a network of copper wire, steel towers and wood poles, have been created to put the power of moving electrons at the fingertips of the 25,000,000 customers of the light and power industry.

Though it sprang from the genius of inventors like Volta, Faraday, Edison, Westinghouse, Steinmetz, this service was not created overnight by waving wands. It can be crippled, paralyzed, even destroyed, by unwise legislative acts, but it cannot be replaced by appropriating funds and creating bureaus.

This industry today is a vital living thing, a product of individual initiative—brick and mortar, steel and cement, copper, lead and iron mined from the bowels of the earth, tropical rubber, southern cotton, poles from the forests, porcelain from the kilns, giant forgings machined to tenths of thousands of the inch by master craftsmen, castings, stampings, turnings, raw materials from the ends of the earth, the products of every state in the Union, the labor of every craft, all assembled and given life under the direction of skilled engineers and all paid for by the thrift of American investors.

Two hundred and fifty thousand employees with an average annual wage of $1,400 work to operate and maintain this system. At the head in each company stand the men of business, the executives who are responsible for this stupendous administrative feat. They have tapped the wells of private, not government, credit for twelve thousand million dollars to pay for these physical facilities.

These men have taken the savings of the thrifty and created this service. They are responsible, first of all, for the continuing flow of this vital service from the generating plants to the switches of their customers. The service must not fail. They are responsible to their employees for their livelihood and security. The laborer is worthy of his hire. They are responsible to the investor for the safety of his savings. The value of the plant must be maintained. They are responsible to their communities for adequate and continually growing service. The service must be ready to meet the demands of any and all at any time. They are responsible to their customers and to the state that the price charged be reasonable and fair to all. There must be no unjust discrimination between customers and the price of electricity must go down. They are responsible to the investor for the hire of his money. The investor is entitled to a fair return.

This is the story of the light and power industry from the investor's pocketbook to the customer's switch. Here are the facts and figures to determine how this industry is meeting its responsibilities. This is the story of the vast majority of companies, holding and operating, that are proud of the service they render to customers, employees, communities and investors.

A retail business

Electric service has come to be in the class of the telephone, the grocery store and the gasoline station. It is a retail business dealing with 25,000,000 customers who must have service continuously and in unlimited amount. The cost of this service averages 10 cents a day to the home owner and this is only a 2 per cent item in the family budget. Electric power cost to the manufacturer also is an item that averages about 5 per cent of total manufacturing costs. Thus the magnitude of the utility business is produced by the 25,000,000 individual customer payments that add up to give an annual gross revenue of $1,837,000,000 and require a present investment of nearly seven times the annual revenue, or $12,900,000,000 in power stations, lines, substations and other facilities to supply an ever-growing demand for instant service.

Electric power supply is a peculiar business. It has its own individual balance sheet of expenses and revenues. An understanding of balance

# of Electricity Supply

Facts and Figures on What Three Million American Investors Have Built With Their Savings to Serve the Homes and Industries of Their Fellow Citizens

sheet figures necessitates an understanding of a large and quite special business enterprise. For example, in the ordinary retail store the annual sales income is often three to five times the capital invested in the business; an investment of $100,000 may support a sales income of $500,000 a year. In the utility business the annual sales income is less than one-seventh of the magnitude of the capital investment required; an investment of $12,900,000,000 is made for an annual gross income of $1,837,000,000. In the jargon of finance, capital turnover is very slow in the utility business and capital charges are relatively large in the sales price. It is roughly 1/25 as rapid as is the case in retail merchandising operations, where some stores turn over their capital ten to twenty times a year.

Items of capital investment

Another peculiarity of the business is that both custom and the fact that it is a regulated industry have brought about the use of refunding finance instead of retirement finance. It is not permitted to charge this year's customers high rates so as to write off its plant and thus charge future customers lower rates. In other words, the capital investment is not retired at a rapid rate, such as is the practice in ordinary unregulated manufacturing, but continues in existence and grows ever larger as the industry expands, except for itemized retirements of obsolete or worn-out plant provided for in depreciation reserves. Under this principle a dollar invested in the utility business is considered safe and almost permanent and merely demands its hire or interest charge as a cost item spread over the years. This principle makes for low rates as well as fixed and ever-growing capital requirements as the the business expands.

Let us consider the investment item of the utility balance sheet. The facilities that are needed in electric power supply are visible. Power houses are gigantic affairs and substations are smaller, beautified power houses. The triangular lace of transmission lines graces the winter as well as the summer landscape. The pole lines carrying their burden of transformers, insulators and wires traverse the streets and alleys of thousands of cities and towns. Under the pavements in metropolitan cities are buried treasures of copper and lead cables to carry electricity on its path to service. Utility warehouses, office, stores and service stations are community assets. Even the smallest customer has a capital investment of $300 unknowingly behind his service, and another one may have upward of $1,500.

But the comment is made that the $12,900,000,000 of total capital investment is largely water and write-up. How may this be checked? A method developed by engineers, and therefore logical and factual, is based upon generally recognized average unit costs. These unit costs can then be multiplied by the number of units to give totals. Let us apply this method to the tangible physical facilities in the utility business as shown in table below.

This approximation shows that the present investment of $12,900,000,000 for all electrical utilities is represented by actual equipment to serve its customers. It makes no provision for cash and working capital. It is interesting to note that actual capital expenditures for facilities during the years 1921 to 1931, inclusive, were $7,410,000,000—an enormous sum. This period alone accounts for more than 56.5 per cent of the present investment. The effect of the depression is evident in that total capital expenditures in the three years from 1932 to 1934 were only $811,000,000—less than a single year's expenditure in the previous decade.

Wages for labor

The spending of these colossal sums meant employment of labor in countless ways: For the lumberjack to cut poles, for the copper miner and smelters and wire drawers for copper wire, in the construction industry for brick and mortar and cement, in the iron mines and steel mills for structural steel, skilled mechanics in the electrical equipment factories, rubber and cambric for insulation, paint and varnish for protection, train crews to bring these component parts together, linemen, builders, masons and steel workers to erect them, and in countless other places throughout the intricate fabric of American life. This meant business and prosperity for practically every American industry, still more expansion of electric service facilities, a reduction in the cost of the service and, above all, courage and initiative within the electrical industry.

A CHECK ON UTILITY CAPITAL INVESTMENT

	Unit Cost	Total Units	Total Cost
Steam power plants.	$126 per kw.	24,000,000 kw.	$3,000,000,000
Hydro power plants.	178 per kw.	10,000,000 kw.	1,780,000,000
Oil engine power plants	130 per kw.	416,000 kw.	54,000,000
Transmission lines..	14,300 per mile	208,000 miles	3,000,000,000
Substations	$19 per kw.	81,000,000 kw.	1,500,000,000
Distribution	132 per customer	20,500,000 customers	2,700,000,000
Offices, shops, etc...	.....	.....	900,000,000
Total	.....	.....	$12,934,000,000

Expansion in business means taking a business chance. Utility men are ready to continue this record under fair conditions of business development.

On individual properties the capital investment is a variable, depending upon the type of property, the territory, the customer density and many other factors. Under regulation the record of capital investments is kept by a uniform system of accounts which are readily determined. It is the actual investment in a property that is used in fixing rates and not the securities that represent the capital. An example of the capital investment allocation to a typical widespread transmission system serving all kinds of loads and communities is as follows:

	Per Cent of Total
Generating stations	42
Transmission lines	20
Substations	12
Distribution	21
Offices, etc.	5
	100

The cost of an individual item varies quite widely. Steam plants may cost from $80 to $150 per unit of capacity. Hydro stations from $90 to $350 per unit. Transmission lines are of all voltages and types and will cost from $7,000 per mile in open territory to more than $1,000,000 per mile in congested urban areas where right-of-way is expensive. Substations may represent a few transformers on wood poles or a beautiful city structure, with a price range from $12 to $80 per unit of capacity. Distribution is a broad term for all facilities from substations to customer premises. In some cases it is overhead and in other cases it is underground. Its cost varies within wide limits and a typical example from a widespread system for some major items in distribution on a per customer basis is as follows:

	Urban Cost per Customer	Rural Cost per Customer
Poles, wires and fixtures	$18.00	$96.00
Overhead transmission	9.00	20.00
Meters and services	18.00	20.00
Proportion of general system investment	10.00	10.00
Total	$55.00	$146.00

Many elements, such as rolling or level land, clay, sand or rocky soil conditions, customers per square mile, the types of houses and apartments lived in and the use of service, all affect the cost of distribution. The use of averages is only a statistical figure, for the unit cost per customer may run from $50 to $300 on overhead systems and from $150 to $1,000 or more for underground systems.

Nor is it easy to allocate capital costs equitably. A large industrial plant may be adjacent to a power station, another may be miles distant, a domestic customer near the station may use 10,000 kw.-hr. a year and another 20 miles away 200 kw.-hr. Tracing the actual facilities required to serve each customer translated into capital investment is like walking in a labyrinth, and only skilled analysts can apply individual property costs in rate making.

Where does the capital come from? Like any other business, money must be borrowed and securities issued to get capital. In the normal utility property the total capital is represented by bonds, preferred stock and common stock. About 60 per cent of the capital is represented by bonds or mortgages that carry an average interest charge of about 4.84 per cent; preferred stocks are based upon 6 or 7 per cent dividends and common stocks merely represent the equity or profit margins of a going business. Often about 20 per cent of the capital is in preferred stocks and 20 per cent in common stock. A few companies have no bonds, but are financed wholly on a stock basis.

The holding company is famous for a variety of reasons, excellent and execrable, past and present. Irrespective of the past, just as electricity has its own nature and essence and being in the universe, so does the finance and economics of electricity make the chaining up of many little units and systems into vast systems fall to a natural lot, become essential and exist in fact and in history. The holding company that undertakes and manages this chaining up is the agency that issues and sells to people utility securities for investment. It is the securities of holding companies in electrical utilities that thousands of in-

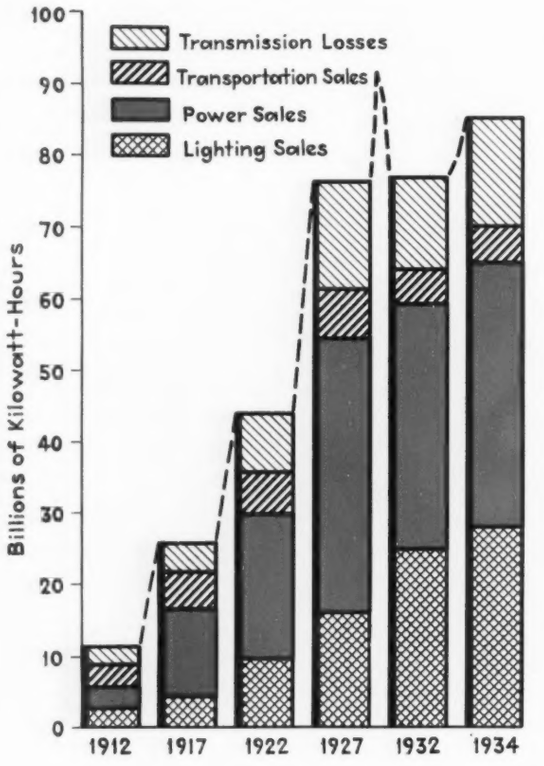
[*Turn to page 64*]

Where the Business Now Exists

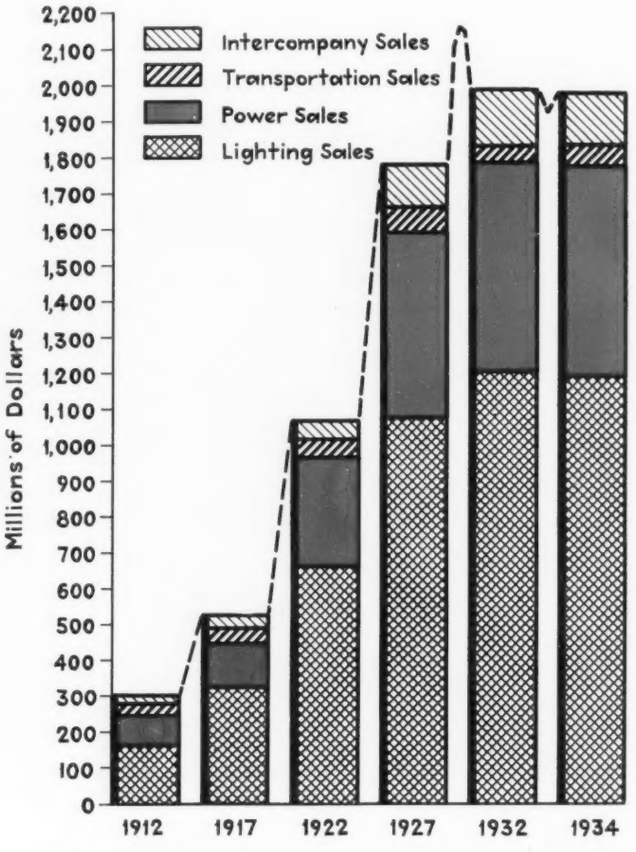
Electrically the nation is concentrated in its northeastern quarter. That's where three-fourths of the present consumers are. That's where the immediate market centers. But the big open spaces are the markets of the future. The map areas are reduced to proportionality with the number of customers in each of the nine geographical divisions.

STATES	SQUARE MILES	TOTAL KW. HR.	TOTAL UTILITY REVENUE	RESIDENCE CUSTOMERS	DENSITIES PER SQUARE MILE Kw. Hr.	Rank	Revenue	Rank	Customers	Rank
① MIDDLE ATLANTIC	102,354	21,560,000,000	$541,000,000	5,909,000	210,000	1	$5,350	1	58.3	1
② NEW ENGLAND	66,424	5,830,000,000	157,000,000	1,886,000	87,900	2	2,400	2	28.4	2
③ EAST NORTH CENTRAL	248,105	20,220,000,000	415,000,000	4,958,000	73,500	3	1,510	3	18.0	3
④ PACIFIC	324,123	11,490,000,000	181,000,000	2,035,000	35,400	4	560	5	6.28	4
⑤ SOUTH ATLANTIC	282,910	9,970,000,000	162,000,000	1,574,000	35,200	5	573	4	5.37	5
⑥ EAST SOUTH CENTRAL	181,483	3,350,000,000	64,000,000	674,000	18,450	6	354	6	3.71	7
⑦ WEST NORTH CENTRAL	518,109	5,390,000,000	158,000,000	1,961,000	10,400	7	305	7	3.78	6
⑧ WEST SOUTH CENTRAL	437,794	4,380,000,000	102,000,000	1,025,000	10,000	8	231	8	2.34	8
⑨ MOUNTAIN	865,017	2,700,000,000	53,000,000	499,000	3,120	9	61.2	9	0.58	9
U. S.	3,026,789	84,890,000,000	$1,833,000,000	20,520,870						

Why Not Encourage to Resume

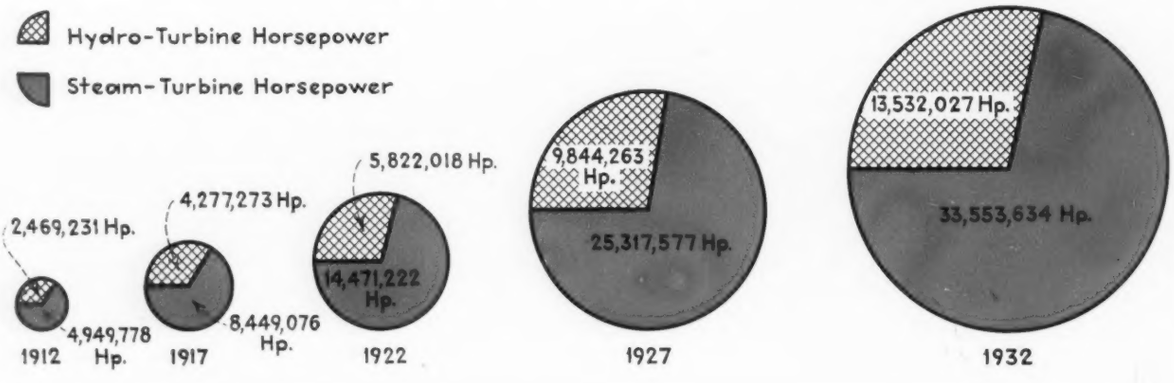


KILOWATT-HOURS STILL GO MOSTLY FOR POWER USES BY INDUSTRY

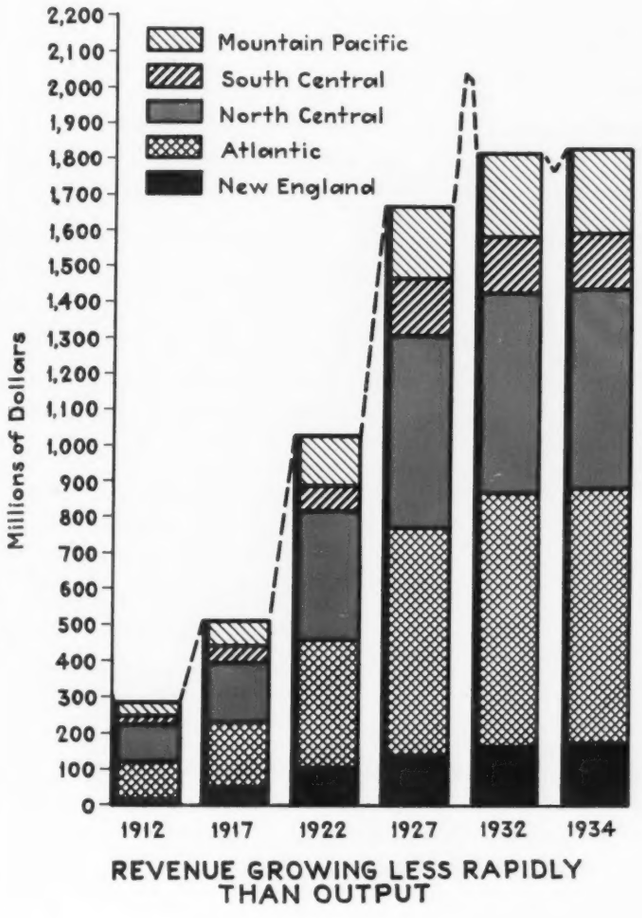


MAJOR PORTION OF REVENUE COMES FROM MULTIPLICITY OF HOMES AND BUSINESS

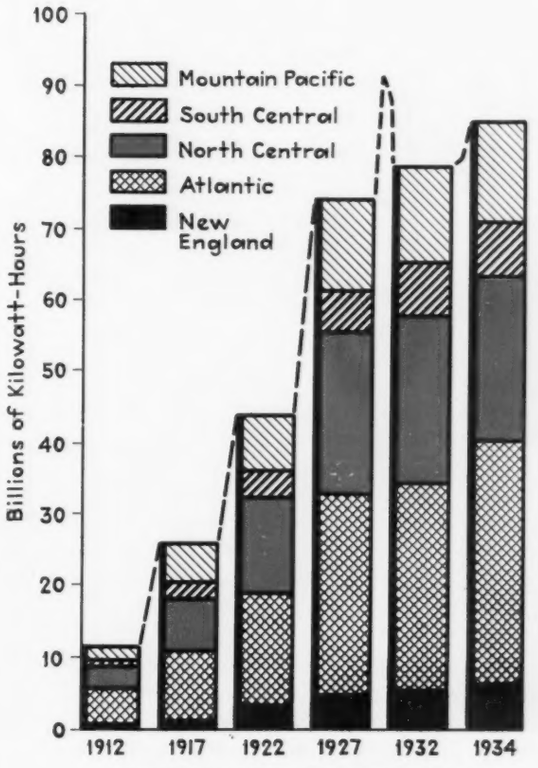
WATER POWER ACCOUNTS FOR ONLY 30 PER CENT OF



Power Industry Growth

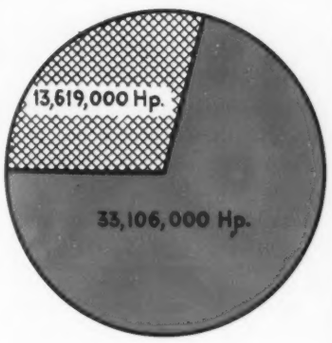


REVENUE GROWING LESS RAPIDLY THAN OUTPUT



NORTHEAST QUARTER OF COUNTRY TAKES THREE-FOURTHS THE ENERGY OUTPUT

GENERATOR CAPACITY



1934

PAST RECORDS CAN BE EXCEEDED

If the Utilities Are Not Destroyed

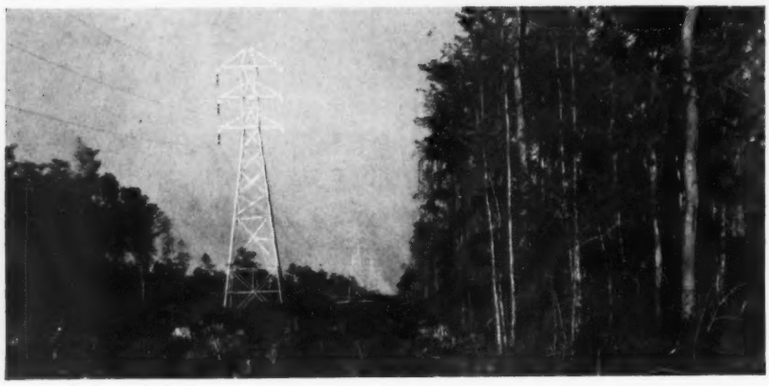
—Magnitudes in no slump, merely poised for advance

—Home and commercial consumption catching up on use of power in industry

—Rate reductions keep revenue static with output rising

—Generating capacity practically unchanged since 1930

—Hydro plays progressively decreasing part in generation



vestors know and purchase. Another way to raise the necessary funds has not been found on any scale.

Utility bonds are conservative and stable securities held by thousands of individual investors and large investors such as insurance companies, banks, investment trusts and endowment trusts. Under most state laws, bonds must be backed by risk-taking equity securities before they are eligible for savings bank investment. Preferred stocks are held by other thousands of investors who are willing to take a small risk for a slightly larger return. Common stocks are held by still other thousands of investors who believe utilities should and can make a reasonable profit, and they also form a large part of the investment portfolio of the holding companies. Money in the past and money in the future must depend upon investor confidence in the industry. This depends upon having a prosperous industry. When credit or the ability to sell securities disappears the customers—and they are the public—suffer, and both expansion of facilities and economies in operation are made impossible.

The cost of the $12,200,000,000 capital on the 1934 private utility balance sheet is represented by annual charges of:

$340,000,000 for interest on debt obligations
$203,000,000 for preferred stock dividends
$123,000,000 as an estimate of common stock dividends
$22,000,000 for surplus, reserves and other proper capital charges

This total of about $688,000,000 is only 5.65 per cent of the total private utility capital investment, yet it is about $30 per customer. And this capital charge was not paid in full because the industry was not sufficiently prosperous. On even a 6 per cent return on the over-all investment the charge for capital should be $733,000,000 a year or about 40 per cent of the gross income from service. This is the item of cost that is so difficult to understand and to collect, because the kilowatt-hour or unit of energy is used as basis for customer payments.

But capital costs are but part of the expenses of the utility business. A growing and important item is the tax bill. This was $240,000,000 in 1934, or about $10 a customer per year, and bids fair to be even larger in 1935.

Another cost is the payroll for the 250,000 employees. There is an item of fuel for generating energy and for supplies to maintain the system. All the direct operating expenses for 1934, exclusive of taxes, reach a total of $787,000,000, an item of about $35 per customer. Retirements and an item that takes care of miscellaneous charges add $152,000,000. This brings the total operating costs of the business to $1,179,000,000.

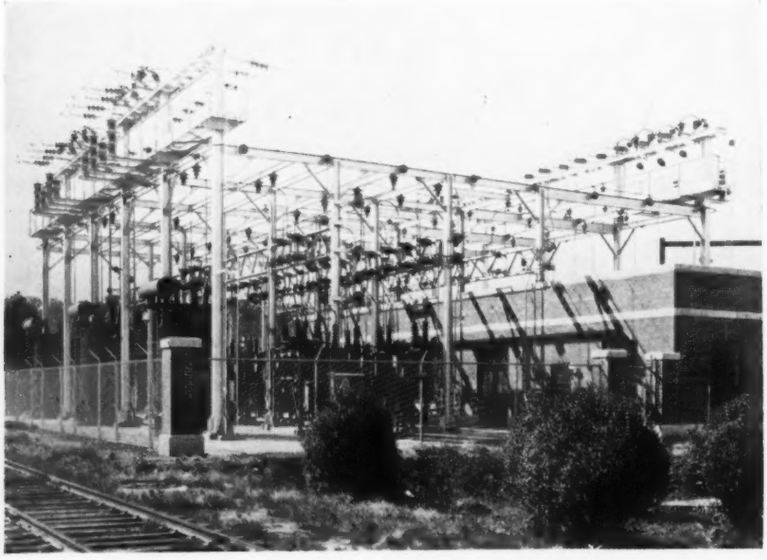
Variation of costs with use

It is interesting to look at the cost of power supply in terms of the use of energy by customers. Bills are paid upon the basis of kilowatt-hour use, but only a small part of the costs are directly affected by a change in energy use or are measured by energy.

Today the average selling price per kilowatt-hour per customer for all customers is 2.59 cents. The average use of energy per customer is 2,850 kw.-hr. per year. Each customer requires, then, 1.36 kw. of generating capacity. Now at the power house, the pure generating cost of this customer's present kilowatt-hour is just about 7 mills, whereas the cost of additional kilowatt-hours that he might be induced to use runs only to 3 mills each within the power house. Seven mills is less than 30 per cent of the average customer unit energy price. The other, and far greater, costs are for distribution, operating and overhead charges concerned with the delivery, not the manufacture, of the salable product. Electricity isn't electricity until it is delivered; that is, applied. This great factor is what is called distribution. And there is the reason why the small, reasonable, forseeable economies in the costs within power houses have so little effect upon the total costs and, inevitably, upon rates. It takes a very great feat of invention in the manufacture of electricity to make a substantial reduction in its distributed, or applied, cost.

Electricity, thy economic name is continuity! People have a way of spending their time in work and play in such fits and starts that power facilities are working to capacity only 40 per cent of those unchangeable hours. Because people change their immemorial habits slowly it would ap-

[*Turn to page 68*]



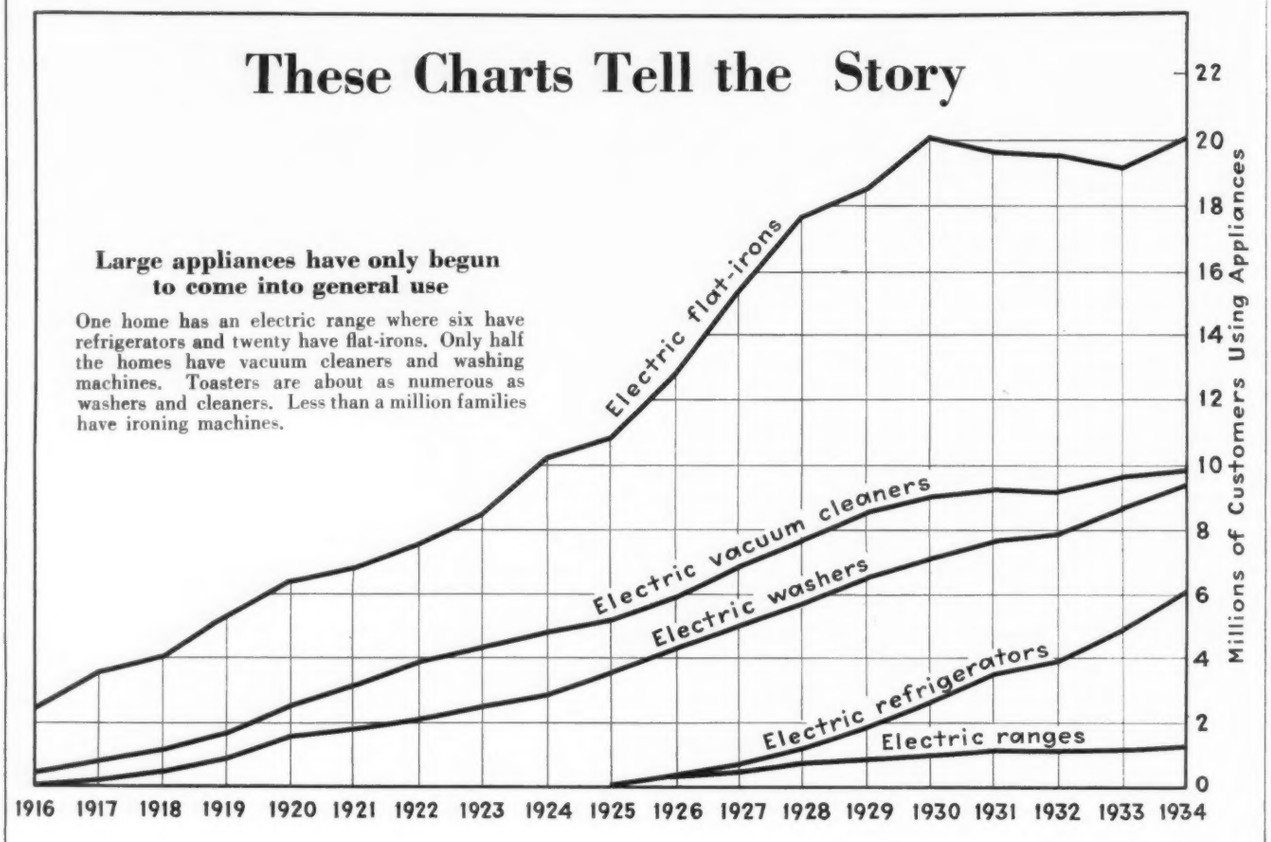
OUTSTANDING FACTS

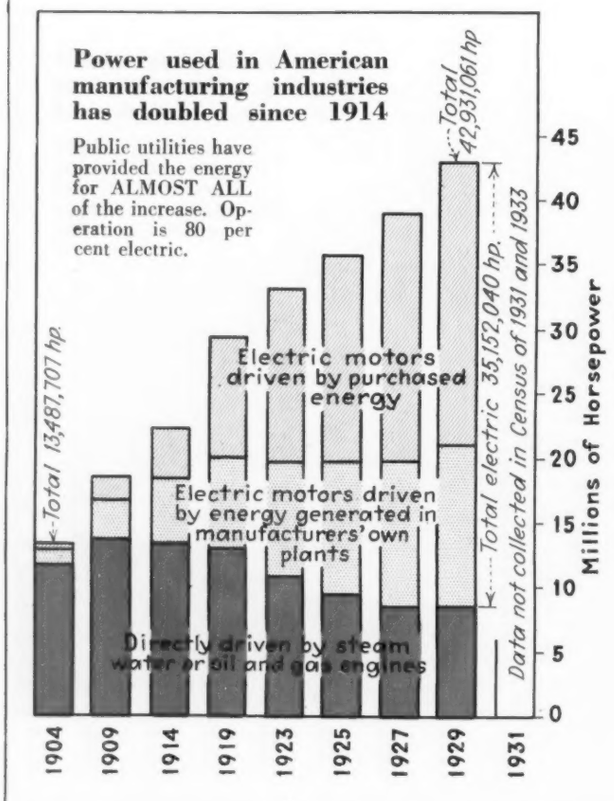
Figures are on electric light and power industry for the year's operations or as of the end of each year.

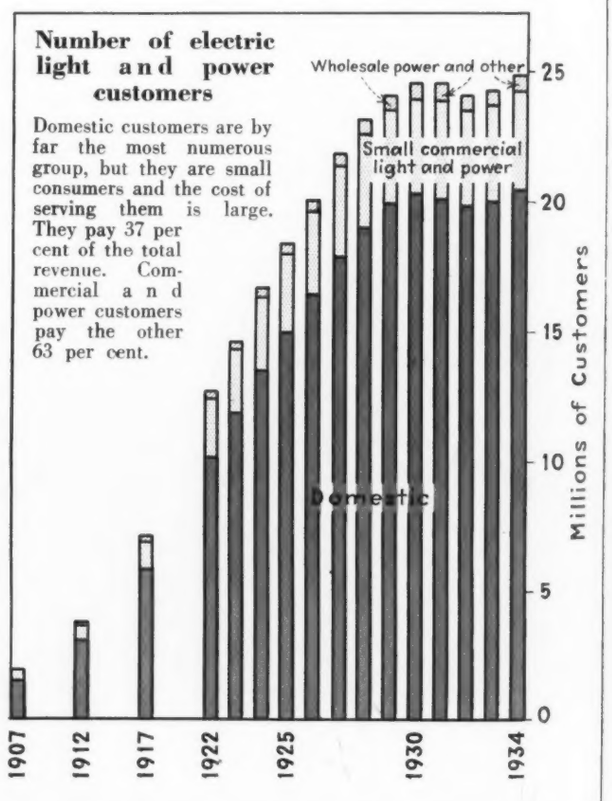
	1927	1928	1929	1930	1931	1932	1933	1934
CAPITAL invested ($1,000)	9,500,000	10,300,000	11,100,000	11,800,000	12,400,000	12,600,000	12,800,000	12,900,000
Securities sold ($1,000)	2,152,527	1,653,180	1,468,895	1,591,986	1,491,742	465,921	56,248	129,815
By investment houses ($1,000)	[3]1,889,000	[3]1,471,498	[3]1,315,459	[3]1,452,854	[3]1,341,742	[3]1,341,742	[3]55,873	[2]129,815
Direct to customers ($1,000)	263,527	181,682	153,436	139,132	150,000	18,000	375	.....
REVENUE, for elec. service ($1,000)	1,802,655	1,941,955	2,105,900	2,151,150	2,125,110	1,979,990	1,906,110	1,970,196
From ultimate consumers ($1,000)	1,661,032	1,784,309	1,938,520	1,990,955	1,975,944	1,832,596	1,773,416	1,837,046
Domestic ($1,000)	523,689	571,620	618,799	664,441	678,611	669,200	656,570	677,697
Small light and power ($1,000)	482,136	519,957	555,640	575,598	564,524	528,861	499,684	511,682
Large light and power ($1,000)	519,074	549,989	613,171	590,992	570,127	476,451	465,191	495,657
Municipal ltg. and misc. ($1,000)	82,996	90,695	98,646	107,841	114,045	113,952	109,462	107,446
Railways and railroads ($1,000)	53,137	52,048	52,264	52,083	48,637	44,132	42,809	44,564
Other sources ($1,000)	141,623	157,646	167,380	160,195	149,166	147,394	132,694	132,750
EXPENDITURES								
Additions and extensions ($1,000)	760,353	786,977	866,344	960,890	633,415	260,000	180,000	170,000
Operating, total[1] ($1,000)	828,168	866,350	934,890	946,180	913,910	[7]817,950	795,811	858,000
Salaries and wages ($1,000)	390,000	.....	.....	.....	.....	[7]323,822	292,000	317,000
Taxes ($1,000)	157,000	.....	.....	.....	.....	[7]205,151	.....	240,300
ENERGY (1,000,000 kw.-hr.)								
Output, central stations	74,686	82,927	91,421	89,952	86,312	77,868	79,983	85,610
From fuel	45,968	49,419	59,031	59,388	57,742	45,991	47,533	53,550
From water power	28,718	33,508	32,390	30,562	28,570	31,877	32,450	32,060
Total; incl. imported and purchased	76,369	83,394	92,757	91,957	88,400	79,505	81,913	87,577
SYSTEMS, STATIONS								
Number of establishments	4,335	4,063	[8]2,801	[8]2,755	[8]2,596	[7]3,429	.....	.....
Commercial establishments	2,137	2,153	[8]1,480	[8]1,379	[8]1,308	[7]1,627	.....	.....
Municipal establishments	2,198	1,910	[8]1,321	[8]1,376	[8]1,288	[7]1,802	.....	.....
Companies generating	2,331	2,394	[8]1,699	[8]1,575	[8]1,686	[7]1,788	.....	.....
Companies purchasing all energy	2,004	1,669	[8]1,102	[8]1,180	[8]910	[7]1,641	.....	.....
No. 100,000,000 kw.-hr. systems	124	135	137	142	142	138	137	.....
Transmission (circuit miles)	185,449	[6]173,797	[6]184,931	[6]200,171	[6]208,457	[6]208,097	.....	.....
Generating plants, all central station	4,801	4,352	4,250	[8]3,873	[8]3,746	4,339	4,292	4,438
Commercial	3,589	3,232	3,190	2,863	.....	.....	.....	.....
Municipal	1,212	1,120	1,060	1,010	.....	.....	.....	.....
RATINGS								
Generator rating (kw.)	25,811,305	27,698,305	29,558,637	31,976,138	33,483,821	34,010,137	33,970,602	33,765,000
Prime movers (hp.)	35,710,128	38,544,800	41,551,800	44,747,000	47,112,000	[7]47,966,962	47,940,600	47,646,800
Steam engines and turbines (hp.)	25,317,577	27,360,000	29,512,000	31,540,000	32,250,000	[7]33,553,634	33,442,600	33,106,000
Water wheels (hp.)	9,844,263	11,119,800	11,439,000	12,540,000	14,155,000	[7]13,532,027	13,601,000	13,619,000
Internal combustion engines (hp.)	548,288	575,000	600,000	667,000	707,000	[7]881,301	897,600	921,000
FUEL CONSUMPTION								
Coal and coke (short tons)	37,500,630	37,593,322	41,406,000	39,702,000	35,690,336	27,589,000	28,039,000	30,956,000
Oil (bbl.)	7,145,798	6,852,352	9,740,000	8,950,000	7,898,629	7,269,000	9,446,000	9,915,000
Gas (million cu. ft)	65,523	77,054	112,442	119,457	138,483	107,138	101,000	124,713
ENERGY DISPOSITION								
Sales, ult. users (1,000,000 kw.-hr.)	61,251	66,988	75,294	74,906	71,902	63,764	65,754	70,782
Domestic	7,676	8,619	9,773	11,018	11,738	11,987	11,960	12,798
Small power and light	10,766	11,692	13,106	13,944	13,544	12,932	12,475	13,151
Large power and light	35,263	38,903	44,326	41,621	38,451	31,186	33,723	36,918
Municipal lighting and misc	2,003	2,223	2,450	2,735	2,994	2,944	2,931	2,860
Railways and railroads	5,543	5,551	5,640	5,588	5,175	4,715	4,665	5,055
Company railway depts	1,348	1,330	1,279	1,184	970	843	699	652
Company use and losses	13,770	15,077	16,184	15,867	15,528	14,898	15,460	16,143
CUSTOMERS AND EMPLOYEES								
Customers, total	21,786,212	23,153,252	24,147,183	24,555,732	24,489,770	24,149,300	24,295,515	24,808,537
Domestic lighting	17,950,934	19,089,882	19,967,154	20,331,551	20,151,247	19,849,963	20,004,098	20,484,232
Small light and power	3,358,140	3,532,489	3,598,115	3,628,653	3,724,013	3,687,636	3,697,324	3,727,478
Large light and power and other	477,138	530,881	581,914	595,528	614,510	611,701	594,093	596,827
People in electric lighted homes	75,500,000	80,300,000	82,000,000	83,400,000	82,700,000	82,500,000	82,500,000	85,800,000
Per cent of total population	63.0	67.5	68.0	68.2	67.4	67.0	66.7	68.1
Employees, total	251,020	265,000	289,000	298,000	262,000	244,573	228,000	247,000

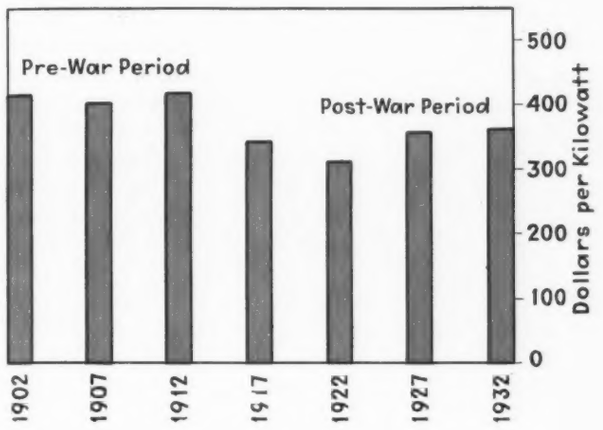
[1] Does not include interest, taxes, depreciation or sinking fund.
[2] Includes institutional investors.
[3] Includes rights.
[4] Includes estimated value of free service, $5,267,000.
[6] 11,000 volts or over.
[7] Census.
[8] Very small ones omitted.

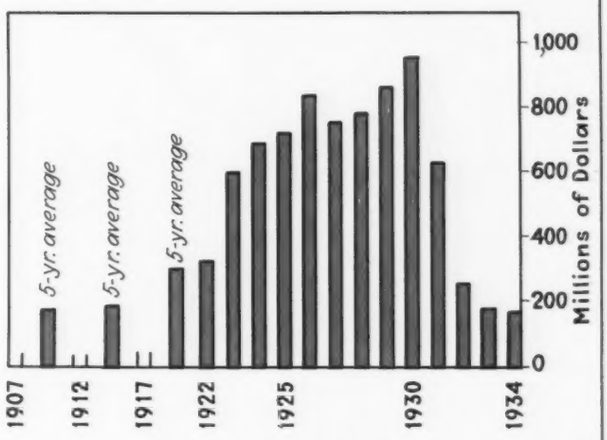
These Charts Tell the Story


Large appliances have only begun to come into general use
One home has an electric range where six have refrigerators and twenty have flat-irons. Only half the homes have vacuum cleaners and washing machines. Toasters are about as numerous as washers and cleaners. Less than a million families have ironing machines.
Electric flat-irons
Electric vacuum cleaners
Electric washers
Electric refrigerators
Electric ranges
Millions of Customers Using Appliances
0 2 4 6 8 10 12 14 16 18 20 22
1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934


Power used in American manufacturing industries has doubled since 1914
Public utilities have provided the energy for ALMOST ALL of the increase. Operation is 80 per cent electric.
Total 42,931,061 hp
Total 13,481,707 hp
Total electric 35,152,040 hp.
Data not collected in Census of 1931 and 1933
Electric motors driven by purchased energy
Electric motors driven by energy generated in manufacturers' own plants
Directly driven by steam water or oil and gas engines
Millions of Horsepower
0 5 10 15 20 25 30 35 40 45
1904 1909 1914 1919 1923 1925 1927 1929 1931


Number of electric light and power customers
Domestic customers are by far the most numerous group, but they are small consumers and the cost of serving them is large. They pay 37 per cent of the total revenue. Commercial and power customers pay the other 63 per cent.
Wholesale power and other
Small commercial light and power
Domestic
Millions of Customers
0 5 10 15 20 25
1907 1912 1917 1922 1925 1930 1934





Investment per kilowatt is smaller than it was in the pre-war period

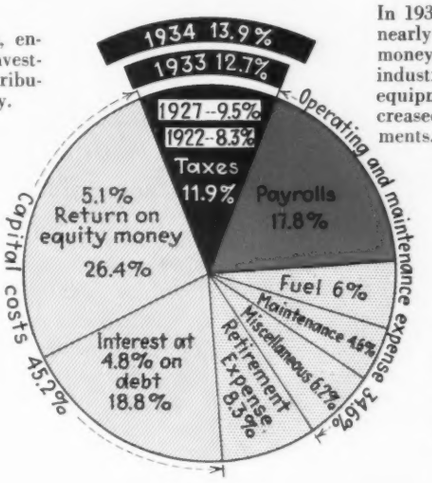
Despite higher wages and cost of materials, engineering skill has made possible lower investments in power plants, transmission and distribution systems per kilowatt of station capacity.

New capital for additional construction

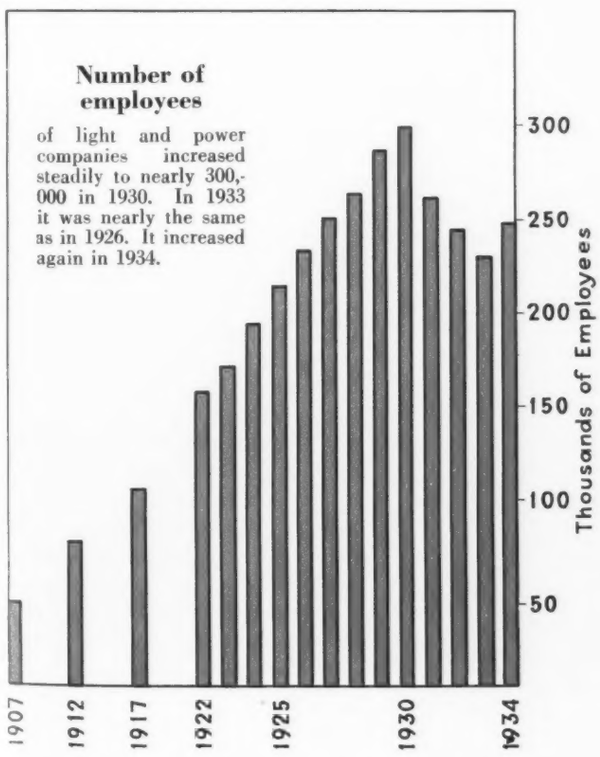
In 1930 electric light and power companies spent nearly a billion dollars for new construction. This money paid labor and gave employment in basic industries. Reduced power sales has now left equipment idle; new construction has lately decreased to one-fifth of previous annual requirements.

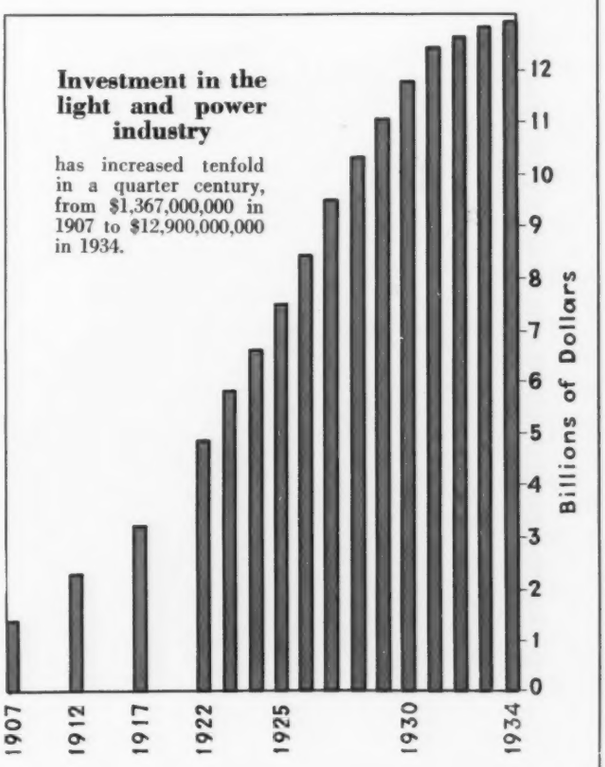
Distribution of the consumer's dollar

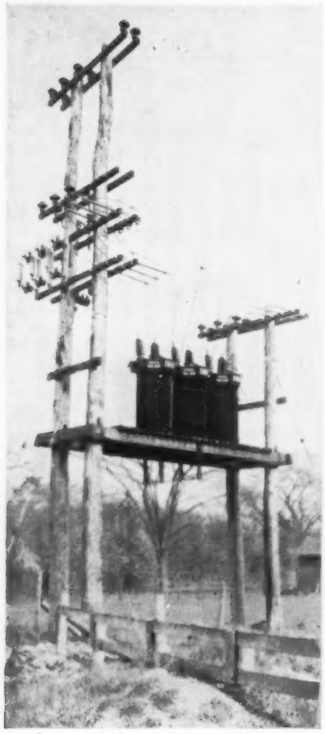
(Based on 1932 U. S. Census)

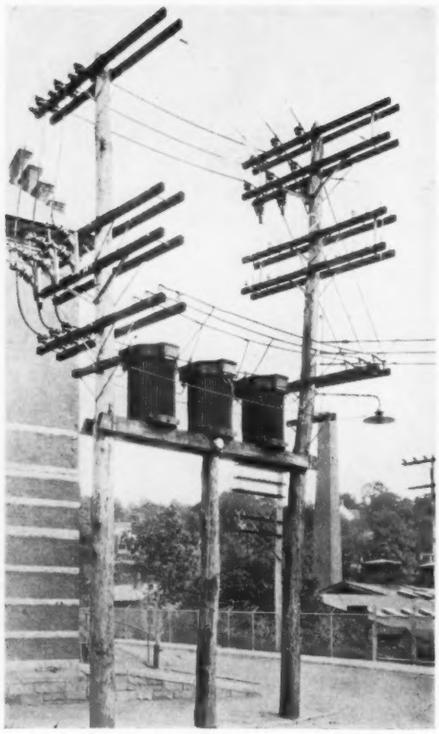


The chart applies to commercial companies only, excluding municipal plants. Inter-company energy sales have been eliminated. Taxes for 1933 and 1934 are based on available returns for those years.

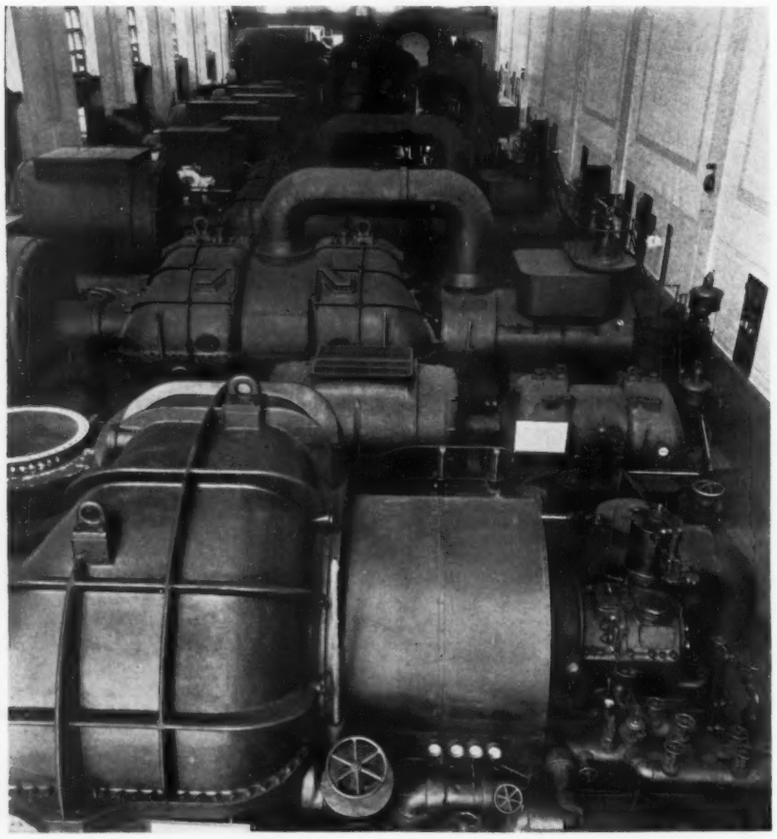








pear to be necessary for power houses to relax in their energy production three-fifths of their existence. The "inducement" or lower rates for the "off-peak" hours is, however, another ingenious example of man's ingenuity in business and aids appreciably in changing customer habits. But progress is slow. Utility systems are going concerns. They stand ready with manpower and facilities at all times, whether service is used or is not used.



When the switch is thrown, like Aladdin's genii, the electricity not yet made leaps into instantaneous action to carry out customer commands.

Costs exist whether service is used or is not used. On one well-planned utility system 80 cents out of each dollar of income must go into costs that result from capital investment and in costs that are independent of energy use. Only 20 cents of the dollar can be allotted, or even used, for expenditures that depend upon the amount of the load. If all the light and life of the giant thing called electricity went out, there would still grind on 80 per cent of what it would have cost to keep on lighting and powering.

This is how costs run on despite use; how "readiness-to-serve" costs take 80 cents out of each dollar of revenue on this particular system:

	Cents
Interest on bonds and dividends on stocks	30
Taxes to city, state and nation	12
Retirement reserve, for the re-creation of the plant, which is wearing out	11
Maintenance and operation	10
80 per cent of total labor	15
75 per cent of the surplus (conventionally established as sound practice)	2
	80

And here is how costs in proportion to the load mount up in terms of each dollar of gross revenue:

	Cents
Fuel	13
Maintenance	3
20 per cent of total labor	3.5
25 per cent of surplus	0.5
	20.0

The final balance sheet

When all costs of the business are thus considered the final balance sheet is made up of several major cost divisions. These are summarized:

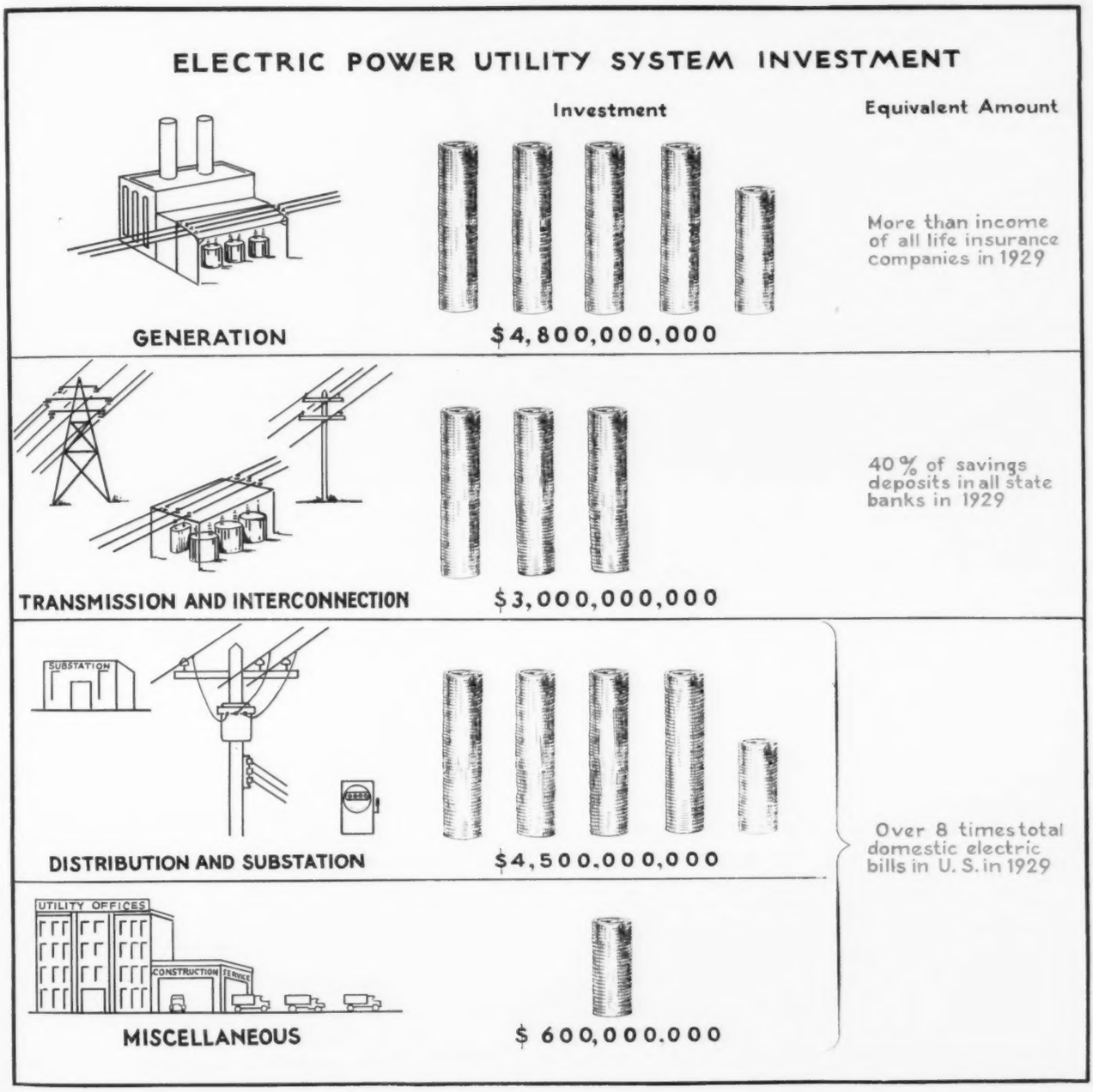
1. Capital costs. These depend upon the credit of the industry. This, in turn, depends upon its earnings and its reputation.

2. Taxes. These depend upon political agencies.

3. Readiness-to-serve costs that partake of both capital and operating costs pertaining to a business that must be ready to give service to each and every customer whenever he wishes it.

4. Operating costs that vary with the use of service very largely.

5. Insurance costs in the broader sense of having to build excess capacity to anticipate growth, to provide for retirements, surplus funds and other normal business cushions to ab-

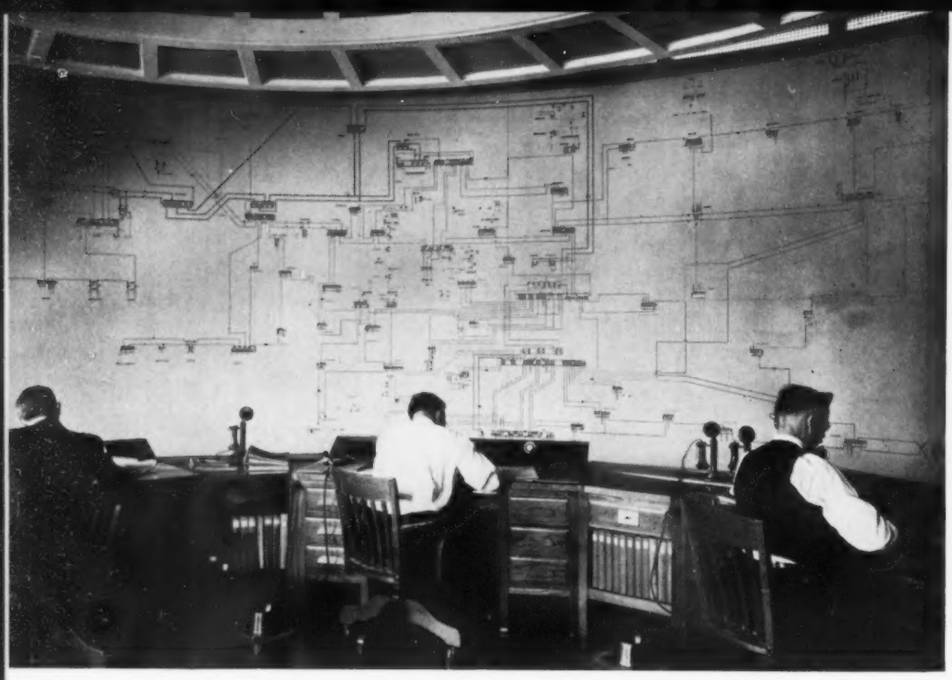


sorb the shocks of business eventualities.

Many of the misunderstandings about the utility business come from the lack of understanding of these costs and their variation. Also, many fail to realize that cost accounting and rate making are two quite different aspects of the business. The end of rate making is of course a fair return on the business, but an individual customer cost-accounting approach to rates is hopelessly inept to meet the actual conditions encountered in the utility business. In addition it would be so complicated and so changed from day to day with changed customer use that only a master chess player would be able to start on the task.

Costs vary widely between utilities and the specific examples cited in this article apply to individual systems and are not general. It is also unsafe to use general averages from the total data for the business. But the use of costs actually obtained on a particular property as a basis for rate making is involved and complicated because, when all is done, customers must be grouped as to classes and as to locations and then averages applied that will be fair and be competitive with other services. The general trend is to make uniform rates over a geographical region to apply to each class of customers, and inevitably the actual costs of serving individual customers in each group vary widely.

Under the program of expansion contemplated, the utilities can carry the added loads and give the required service if investors will lend the money and if they have fair business treatment. Just now their credit is impaired by reason of destructive and mostly political attacks. A continuation of these is the only great hazard to the accomplishment of the utility part of the recovery program.



DIRECTING SYSTEM OPERATIONS NIGHT AND DAY—Apportioning loads between steam and hydro plants for lowest overall costs, arranging for storage and utilization of increased stream flow, preparing for load changes or storms and assigning patrolmen

What's Back of the Switch?

Thousands of Trained Employees Work Night and Day to Maintain Service—Skilled Operators Needed —No Spectators to Applaud Dramatic Performance

ELECTRIC power supply has become an infinitely retail service with more severe demands upon it than any other retail business. Every time a customer desires to purchase power—to light his lamps, run a machine, heat a percolator or melt metal—he doesn't have to endure the usual delays of a retail transaction. He doesn't have to wait for a clerk, state his needs and wait for them to be taken out of stock and packaged. He doesn't have to wait for recording of the transaction, paying for or delivery of his purchase. The instant he or she operates the switch, the power is generated, transmitted, delivered and converted into useful work.

Even when dark clouds prompt all customers to turn on their lights at once the power is available. Even though all street cars and elevators have their greatest traffic about the same time, there is no lack of power. Even though factories start all their motor-driven machines at any time, electricity is available at the turn of a switch.

This individual, unlimited, immediate service, obtainable in no other retail transaction, is performed under handicaps no other retail business encounters. Unlike commodities, electricity cannot be stored for all customers, to be drawn upon when demanded and replenished during the off-hours of little use. It must be produced as required. It must be available in any quantities the customers desire. No delays are allowable for deferred delivery. Because poor quality in electric service spells public dissatisfaction, the quality must be of perfection's best. It must be continuously inspected and safeguarded automatically, because there can be no returns, no exchanges. Fickleness of weather or human frailties must not impair or delay deliveries. Cash is not demanded on delivery. Electric service is a credit business, the customer paying only once a month—after delivery and use of the service.

Despite the public demand for this superlative, individual service, the electric power business cannot charge luxury prices, even if it were so inclined, which it is not. It recognizes that the largest market can only be created by prices graduated down to low unit values, so that there is an inducement to use more power. Aside from power companies' large-turnover-low-unit-price policy, there is a governor-appointed regulatory commission, in most states, which closely watches where money is invested in the business, operating expenses, etc., and stipulates the prices which can be charged. Only a small, fair return can be earned on money invested in used and useful equipment.

What other retail businesses, even those with which the public spends many times more money daily, render such an individualized, quality and speedy service under such stringent requirements? But utilities do not object to these demands. They merely wish the public and their lawmakers to know that meeting these requirements demands large investments and expenses for operating functions which are not apparent to the casual public observer. But most of all, they wish these same people to recognize that electric service is an intensely retail business, and, like such business, its distribution expenses are many times the production expenses.

Only a fraction of the investment for electric service is visible to the public eye unless a methodical, guided search

is made for it. True, the public sees an occasional gigantic power house, if a steam plant is recognized by its stacks or hum. Occasionally, a water-power plant is passed on a week-end excursion afield. At the same time, steel-tower transmission lines that stand like sentinels of progress upon the landscape may also greet the automobilists' eyes. Substations may be recognized if the equipment is outdoors or if it is connected to a prominent transmission line. But many are concealed in structures like the buildings that surround them, or are hid below sidewalks. When maintenance or construction men are scaling poles into the skies or climbing out of holes in the street, a fraction of the elements used for distribution may attract public attention.

Hidden away from public gaze in the power houses and substations that few people see are equipment investments that transcend the investments in other buildings of even greater size. Just one large steam plant may represent $60,000,000 investment, and hydro plants, costing twice as much, including water storage facilities, are in existence. The windmill-like transmission lines, of which the public sees only a few, run into investments as high as $45,000 a mile, depending on right-of-way costs and importance of the line. Others, constructed of wood poles and less impressive in appearance or cost, serve in large measure to interconnect plants and systems and are often overlooked by the layman. At various unfrequented spots where these lines join to pool the power available from separated generating plants and systems are costly switching and transforming stations—all essential to adequacy and continuity of service.

Inside business sections are substations, which in metropolitan cities may represent as much as $450,000 investment apiece. But more elusive to the public eye are the investments in underground circuits. Beneath your feet in a metropolitan city there may be buried an investment in circuits and service equipment amounting to millions of dollars. Added to the substation investments in residential sections are investments in poles, conductors, transformers, house services, etc., amounting to more millions of dollars.

External appearances give little indication of the investment made to render electric service which every one demands, but knows so little about. And the magnitude of the total investment (see page 65) is what it is, largely because of the cost of getting power from the generating stations to the customers and measures taken to give the public the quality of service it demands.

Hidden servants

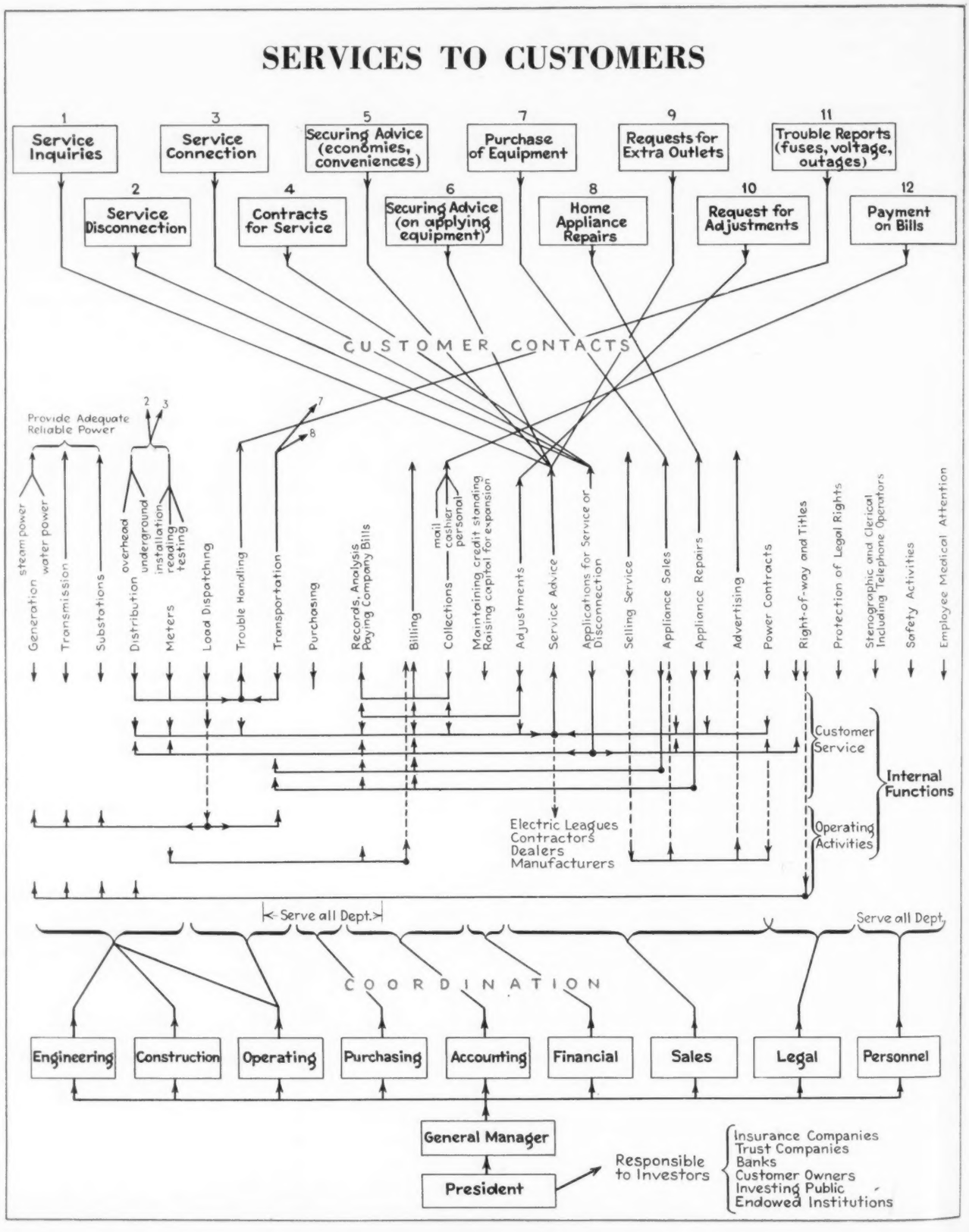
Back of the switch is more than an enormous investment in service equipment. There are some 250,000 human beings rendering this intensely retail service, engaged in multitudinous functions never seen in perspective by the public. Some shape or operate the physical system, always confronted with the conflicting requirements of quality service and low unit costs. A large portion of the employees are engaged in providing specialized services—all planned and co-ordinated so the public may be served most expeditiously. Operators are guided by executive command to maintain service even if economic requirements cannot always be met. In dealing with customers, utility representatives are instructed to treat them with the same thoughtfulness, consideration and cordiality which they would a visitor to their homes.

This policy of "Serve the Public" is not a gesture. Friendly relations are essential to permanent success of any business. If an occasional representative fails to live up to the spirit of this policy it must be remembered that any one short of a saint may lose his temper after a particularly trying day, after verbal chastisement by an unreasonable customer, or when he or she has some home worries in mind. One drop does not make an ocean; neither does one employee make a company. However, all employees are warned by

ATOP THE POLE—Installing, changing, testing, repairing are constant functions of the linemen whose tasks are made harder by storms.

WHEN SLEET OR WIND WRECKS CIRCUITS—And when lightning burns out service equipment, then is when a multitude of human functions combine to restore service promptly.

their executives that one employee can make or lose the friendship of a customer. Continuous effort is made to weed out employees who are indifferent to this responsibility or inherently unadapted to its fulfilment. But some may escape their superior's attention. Persons who doubt that "service" dominates the actions of most utilities, or that they lack a soul, would acquire the opposite impression if they could observe utility employees at work as the editors of ELECTRICAL WORLD have done for years. There they would find the service-spirit permeating every thought and act with sincerity of purpose, honesty and frankness as outstanding characteristics.



ALWAYS TESTING METERS—
But they are so accurate each one need be tested only once in four to five years and then they are usually favoring the customer.

Unfortunately for cordial relations, the public personally meets only a few utility representatives, because it relies on the telephone and correspondence for most contacts with the utility. Too bad every one cannot meet all classes of utility employees at their work and know what thoughts guide their actions. But we can give every reader a glimpse of some interesting things he would find personally. To cover completely the hidden drama back of the every-day functions that seem to the public to be automatic services is beyond the scope of this portrayal of the human function back of the switch.

In all but the smaller communities, where bills are paid at the utilities' offices, the public seldom has intimate contact with any one but the meter reader. But many departments are at his service. For example, there are: (1) The application department, which expedites requests for service or expansion of service through the construction, meter and accounting departments; (2) the construction department, that connects the services, sets a pole or transformer; (3) the meter department, that installs the meter and tests it periodically for accuracy; (4) the meter-reading department; (5) the ever-willing information department, that answers directly or refers the customer to the best source; (6) the trouble department, busiest during wind, sleet and lightning storms; (7) the appliance-repair department; (8) the home-service department, that helps housewives solve their domestic problems by electricity; the farm service men, who help the farmer use electricity to best advantage; (9) the industrial service department, that helps commercial, industrial customers in applying and using electricity most economically; (10) the adjustment department, that rectifies misunderstandings and errors.

But back of all these public contacts are men whom the public seldom sees. The engineers are always planning years ahead on generation, transmission and distribution to give the public the best service that can be rendered at the lowest cost. The operators are always on the alert to maintain continuity and quality of service under every condition, ready to supply every one's demands.

When lightning flashes, when windstorms snap off branches as if they were glass, when sleet overburdens wires and crumples towers—then is when utility forces are stressed to the limit of human endurance. Like firemen, utility patrolmen are dispatched to vulnerable portions of transmission arteries in advance of storms when they can be foreseen. Each section of the miles of line is patrolled on foot by a solitary man bent under Nature's blast, ready to report the location of trouble to headquarters. Construction crews have previously been stationed at strategic points to respond to calls for service restoration as quickly as possible. On double-circuit towers, even those operating at 110,000 volts, the men frequently have to work on the damaged circuits without killing the adjacent circuit just to avoid interrupting service to some community.

Inside cities or towns, where hundreds or thousands of service-outage calls may be received from customers during a storm, the calls must be quickly grouped and maintenance crews dispatched to the district where poles or wires have been torn down by falling trees or branches. Often under such emergencies these field men must work for hours without sleep, with little food and cold-numbed fingers, or exposed to wind-blown branch and lightning. Yet they do it willingly, and why? Because they have "service" bred in their bones.

Rather than inconvenience customers by the prolonged outages

QUICK REFERENCES FOR SERVICE APPLICATION DEPARTMENTS — Just a small portion of the voluminous records and clerks that must be used in rendering service-accounting, payrolls, purchasing, etc.

which would be required to repair permanently the damage to circuits and supporting structures, expedients are adopted to render temporary service. For example, we have seen stretches of an important high-voltage steel-tower transmission line wrecked by one of those eccentricities of Nature and it would have taken days or weeks to replace the towers. In short order, however, wood poles were set up in pairs about 50 ft. apart to support span-wires from which the conductors could be suspended from insulators. Where city pole lines are snapped off by falling trees, electric service is frequently restored before fallen débris can be cleared by substituting insulated cable laid on the ground.

The intensely stirring sacrifices and hardships of linemen during storms have been most dramatically portrayed by William Wister Haines, whose book, "Slim," can be read with as great interest as a thrilling adventure story.

Without audience or applause

But drama is not confined to the life of these field men. Back at headquarters and in the stations are staffs of employees who are working without audience or applause to keep service available night and day—whenever you feel inclined to snap the switch.

Before the storm struck, generating station operators had probably received instructions from headquarters to start additional boilers and generators that could take sudden peak loads in case assistance had to be given to some section cut off from its normal source of supply. Simultaneously, switching-station operators on the transmission system and at substations had probably received instructions to establish connections between the centers of population and various sources of power over indirect transmission circuits avoiding the path of the storm. Or if both were caught unawares, sufficient reserve capacity is always kept in readiness to take more than normal load while more adequate arrangements are being made.

READ OVER 70,000 METERS PER YEAR ACCURATELY—Handicapped by vicious dogs, no one at home, coal or rubbish piled against meters, the meter readers and testers plod on. The few meter reading inaccuracies that may occur are automatically corrected by subsequent reading and billing.

To minimize the lost motion which would otherwise arise in handling emergencies, operators distributed around the system in different stations are provided with definite instructions on what they are to do when their instruments indicate system disturbances, before they get specific orders from headquarters. These steps are so planned and co-ordinated that they build up to the procedure later instituted, without causing any conflicts.

Order and coolness characterize all these operators, whose greatest asset is their ability to handle unexpected situations effectively and quickly. If any one demands rushing and tearing of hair for excitement, it would be lacking even in such emergencies. However, any one who could grasp the significance of such emergencies and the complexity of handling them would probably be amazed at the mental activity essential to competent operating supervision and execution of the detailed functions. Ability to isolate oneself from the local situation, clearly visualize the broad problem, determine the course of action and then carry out the procedure in the proper order is the essence of service maintenance in this extremely complex business. No time for studied analysis. The remedy must be recognized the instant the emergency arises.

To us who are familiar with utility systems and their intricate problems, the almost instantaneous response of utility operators to system disturbances continues to be an amazing phenomenon. It constitutes an even more thrilling drama than the physical manifestations cited. And yet it is enacted without showmanship or blowing of trumpets, because the employees are trained and co-ordinated so thoroughly. They take these problems as the day's task.

Co-ordination avoids confusion

Broad supervision for handling emergencies centers back in what outwardly appears most peaceful surroundings, tranquil enough for the reading of a story about the Canadian wilds—the offices of the system dispatcher and trouble dispatchers. The first supervises the system as a composite of several elements—generating stations, transmission lines, substations and major load centers. The latter

supervise service maintenance and restoration in the cities or towns.

Greeting the eyes in both offices and most essential to both are the numerous facilities for receiving and sending messages. Without communication they would be greatly handicapped. Hence for supervision far afield, both private and leased-wire telephones may be supplemented with radio or wired radio. And for communication within communities, the local telephone system is used with numerous connections to a corps of attendants.

Spread out on semi-circular panels before the system dispatcher is a miniature replica of the entire system with different voltage lines in colors and terminal switching arrangements in illuminated symbols. The position of every switch is made to correspond with actual conditions on the system, frequently being controlled by small telephone exchange keyboards in front of the operator and his assistants. Equipped with this and ready-reference information on the generator capacity in service or available, the attendants exercise their judgment on how to outwit Nature or disturbances due to equipment. From these desks emanate the instructions to patrol lines, dispatch maintenance crews, reroute power over different lines and increase output from some stations to offset losses from others.

Trouble dispatchers in each community are guided by reports from telephone attendants who are trained to receive calls from customers most sympathetically and to let them know immediate steps will be taken to remedy the trouble. During a widespread disturbance these calls are grouped by districts and retransmitted to maintenance men, who rush out with construction trucks to restore service. When the troubles appear to be due to individual customers trouble-men, similarly grouped and equipped, dash to the customers in order. Hospitals, theaters and other places where service outage may constitute a hazard are given first attention.

SETTING OR REPLACING POLES—A continuous task whether it be for line extensions, rehabilitation, or repair after wreckage by storm.

If the reader were inclined to read further we could explain other interesting functions. For example, how dispatchers change the allocations of power generation among stations with changing demands and water supply to secure maximum economy and still safeguard continuity of service under abnormal conditions. How rainfall or increased stream flow is anticipated and provision made for storage and utilization so the least water will be wasted. How loads are apportioned between hydro and steam plants to obtain the lowest over-all cost. How preparations for increased loads are made when thunderstorms approach.

Getting customers connected most quickly with the best-qualified persons to handle their requests is a problem handled in various ways. Special cheerful telephone operators, well informed on individual functions, have greatly expedited this problem in some companies.

Customers do not realize that applications for service must receive the attention of the distribution department, construction crew, meter department, accounting department and sometimes the city inspection department, because they are saved wearisome trips to each department by the application clerk and intercommunicating mechanisms.

Few of the public know that each meter reader, of which there are many, has to read as many as 70,000 meters per year without error. And how rarely do they realize how a vicious dog, no one at home, coal and boxes piled up against the meter and the like inconvenience these human beings in their duties.

When some one is dragged unconscious out of a lake or river, when some one is asphyxiated, when some one is injured on the street—the first attendant giving first-aid or resuscitation treatment is frequently a utility employee. That is an essential part of his training.

Skipping over the variety of other services available, we come to the home-service women. They cheerfully help housewives' clubs to simplify their planning and preparation of meals and show how to secure artistic effects with light in the homes. Closely allied in function are the industrial-service men, who give free consulting advice to commercial organizations and factories on how to cut down operating costs or get the maximum service out of their expenditures for power. Rural-service men give similar aid to the farmer on his operating problems.

All these functions are planned and co-ordinated by equally human department heads and executives. They all wish they had more frequent personal contact with every customer, especially the small ones, because they realize that through mutual understanding comes lasting friendship.

This is just a meager cross-section of the human beings—the soul back of the switch.

WHILE POWER SUPPLY is a highly mechanized business, satisfactory service is largely dependent upon skilled individuals whose functions must be co-ordinated by men who understand all the intricacies of the business. Even though the physical system is the essence of perfection, the utilization of the investment and the service rendered may fall far short of expectations unless the system is operated and directed by men who have had long experience. Given half a chance, these men can add a record of achievement equal to or greater than that of the past 50 years.

GROSS TAXES PAID BY ELECTRIC UTILITIES IN RECENT YEARS

Year	Taxes	Per Cent of Gross Revenue
1912	$13,117,000	4.9
1917	29,897,000	6.4
1922	73,128,000	8.3
1927	150,253,000	9.5
1932	203,858,000	11.7
1933	215,000,000	12.7
1934	240,000,000	13.9
Taxes during 5 depression years	$1,075,000,000	
Taxes during previous 5 years	775,000,000	

UTILITY Aid the $240,000,000

To City, County, State

Utility Taxes Are Sufficient to Pay:

Seven-ninths of federal departmental expenses for legislative, executive, state, treasury, war, justice, post office, interior, agricultural, commerce and labor departments (exclusive of emergency activities)

OR

More than twice the yearly general government expenses of 48 states in 1929, including chief executive, legislature and investigations, treasury and accounting, assessment, levy and collection of taxes, Supreme Court and legal, Secretary of State, board of control and civil service, elections and government buildings

OR

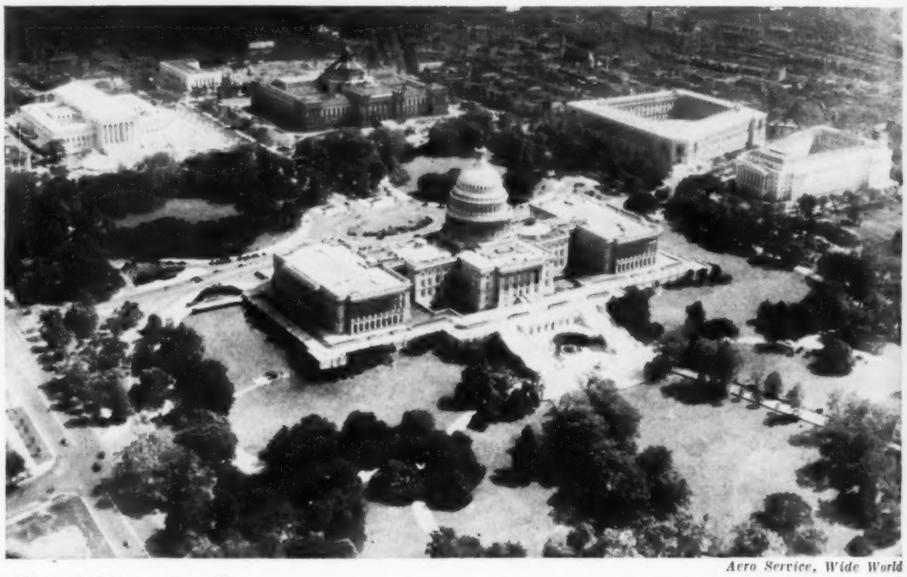
10,000,000 families with inadequate incomes $24 per year for medical services

OR

One-eighth of all aged couples in the United States over 65 years of age $50 per month pension

OR

185,000 families without incomes $25 per week relief (740,000 persons based on four per family).



Aero Service, Wide World

Morris & Bendien

If these taxes were lost . . .

$240,000,000 additional taxes would have to be distributed among other industries and businesses

Equivalent to 67% of general property tax levies of all state governments in 1933

TAXES Nation Paid in 1934

and Federal Governments

Northern States Power Co.

Davis Studios

Utility Taxes Are Sufficient to Pay for:

Erecting rural-service power lines past *every* farm on every state highway in U. S. (not allowing for transformers, service connection or meters

OR

Lighting three-fourths of *all* surfaced state highways in U. S. so headlights would not be needed at night (installation expense)

OR

Salaries of police force for all urban communities having 2,500 to 250,000 population

OR

Salaries of *all* instructors in *all* public grade and high schools in urban communities having 2,500 to 25,000 inhabitants with $25,000,000 to spare for rural instruction

OR

Adequate artificial lighting equipment in *all* public, grade and high school study rooms to save student eyesight, with $105,000,000 to spare.

Utilities are willing to pay fair taxes . . .

Provided PRIVATE Business is not handicapped in developing the potential market. Think of the social value of their tax contribution and the value of even greater payments through business expansion!!

Wide World

The Utility as a Citizen

Intimate Knowledge of Each Community Served Makes Possible Contributions to Civic Welfare— Regional Examples of Utility Accomplishments

THE contributions of electricity to humanity are spiritual rather than material. Dollars will not measure them, nor will the infinite variety of technical accomplishment. Our real citizenship is expressed in measures of comforts and economic welfare. Electricity amounts to so much because it advances our standards of living and working, as has been so often stated by President Roosevelt.

What is the record of this industry in its contributions to society? What can it do further to advance standards of living? Intelligent utility management knows that the business can prosper only as the communities served grow and their inhabitants are successful and happy. Each employee in the industry knows that he must be a good citizen and a good neighbor if his company is to go on giving its service profitably. The utility business is an intimate business. Its money, its manpower and its facilities must contribute to all social and economic assets of the served region.

Scan the records of Rotary, Lion, Kiwanis, Chambers of Commerce. Utility men are up front as members and as leaders. Higher up the scale, when President Hoover appealed to industry to spend and build, in order to avert disaster, utilities responded in whole-hearted action. In times of storm and stress, whether to the home or the community, the men of the light and power industry are indefatigable in aid and service. They are alert and imaginative by nature and theirs is the alertest of industries by its functional existence. Each customer knows that the organization back of the electrical services he gets is always there, always apt. That is of the very régime of electricity.

Empires have gone on a-building. Electricity and electrical men have made this possible. Down in North Carolina the Catawba River wasted its way toward the sea. The cotton of the South grew to picking time and then was shipped away. Mountaineers, with lumbering over, raised ever larger batches of mountaineers, loafed and cultivated not so much their souls as razorbacks and corn. James B. Duke saw these things otherwise. There was a business there, and there was also a regional welfare. He hitched up the hydro power with the cotton, the cotton manufacturer and mountain labor. In a few years he put the desperate Carolinas on the industrial map. Dying, he left Duke Power to endow education, religion and charity. It was a piece of empire building with electricity, but for the citizens.

Pacific hills had water in them after the gold was gone. It was pumped for farming and for manufacturing. It was there, 200 miles up in the hills, before gas and oil were found. It was the economic source of power. Utilities brought this resource over pioneer high-voltage transmission lines to industry in the valleys and on the popu-

lated slopes. Big Creek, Pit River, and other names to conjure with, contributed economic and social welfare to the Pacific Slope. Back of the citrus fruits, vineyards and orchards lie electrical innovations and contributions.

Old New England changed its economy through electricity. Electric and other power had for years been restricted to local stations in the larger cities. Then there came the tying together of interior water powers with tidewater steam plants and the building of a network of transmission lines to form a regional power supply. Small towns, small industries, hamlets and farms got inexpensive and abundant power. New England's industries could locate at their convenience. Established industries could lower costs by moving to the power and could expand production facilities at minimum cost. There was made possible decentralization of production and diversification of labor. Nearly all homes and farms got electrical conveniences. New England has prospered through electrification.

Take the Middle West. There were realities in the Insull empire. They are still there. Perhaps it was the greatest social as it was the greatest economic development of that central area. A great pool of power with its stations, lines and services still functions, affording abundant and inexpensive electricity to all who wish it. Electricity, under the guiding hand of Alex Dow, contributed no little to the making of the great automotive city of Detroit. Keokuk brought hydro and steam together to serve the St. Louis area. The industrial growth of the Middle West is linked to electric power supply made possible by far-sighted electrical men.

In Alabama there was prehistorically deposited iron, coal, limestone and other natural resources. Great rivers ran Gulf-ward, flooding the farms along. Here was an opportunity, and it was utility men who built the Pittsburgh of the Southlands. Great power networks grew, plants were erected—a real American grid was installed in the South. The world heard about it from the new-business departments of the utilities. Industry developed under utility stimulation. Utility money and advice aided local development in altogether new industries. Research in experimental projects solved fresh industrial problems. Utility taxes contributed to local education. Lines were interconnected to adjacent states. New things were started in agriculture. Power was installed in all regions, seeking new uses, new businesses and profitable applications in cities and towns and villages. The tangible, visible reconstruction of the South is electrical. Bold utility men have rehabilitated a region destroyed by war and resuscitated it by the use of their talents and services.

Similar empire building citations can be made for all areas and for local towns and villages. It is a glorious record. What electrical men have put into operation in the form of American power, in scale and in cost, is the envy of the enlightened world. They have daily and hourly done their citizens' part. Their labor brought electricity to all men. Their talents and their wealth went into the development of industry, agriculture, home and farm. In state after state, the university, the utilities and the scientific agriculturalists work long, work hard and work in co-operation for agricultural improvement and for farm electrification. Electrical men are on the depression and relief committees. They contribute time and energy to aid local industries and local people. They are ceaselessly deep in civic welfare.

Some Social Contributions of the Electrical Industry

Retarding discharge of employees in durable-goods industries during early depression by large expenditures for utility system improvement.

Free consulting service to commercial and industrial organizations on methods of effecting economies so less loss or more profits are realized.

Co-operation with farm organizations and agricultural colleges to solve some farm problems by electricity.

Building up commercially backward sections by helping local Chambers of Commerce attract new industries.

Reducing traffic hazards and discouraging crime by encouraging better street and highway lighting.

Saving eyesight, reducing headaches, minimizing hazards in the home, school, office and industry with better lighting.

Stimulating merchants' sales by better show-window and showcase lighting and by illumination aids to selection of goods.

Flood control greatly aided by hydro-plant dams that store and release water gradually and by reforestation that retards run off and soil erosion.

Removing limitations to locations of factories, so far as power is concerned, permitting industries to establish branch plants in economic areas.

Reducing smoke-pollution of air by supplanting multitude of individual fuel-burning plants in office buildings, factories, etc., with electric service and by making possible electrification of railroad terminals and tunnels.

Beautifying shores of hydro-plant storage ponds by reforestation for camping, vacations and parks.

Stimulating civic pride by attractive substations and floodlighting buildings, parks and shrubbery at night.

Home-service aids to housewives on preparing meals, cooking and beautifying the home with artistic yet utilitarian applications of light.

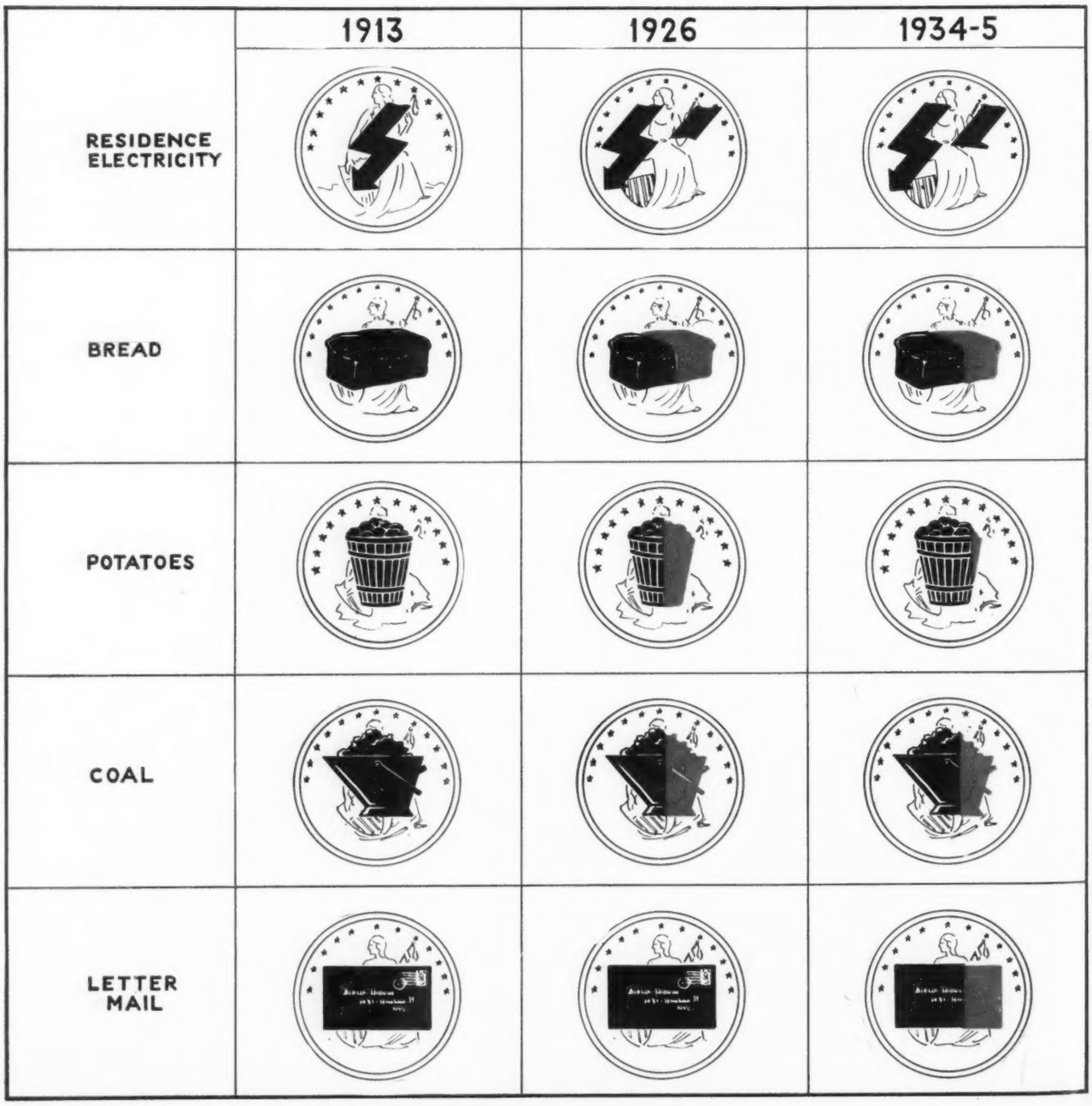
First-aid assistance given to public in cases of asphyxiation, water-immersion, etc., by utility employees trained in prone-pressure resuscitation.

ELECTRICITY GIVES

The Dollar Buys ⅓ More Electricity and

The Green Shows How Much Less

The dollar buys ⅓ more electricity but 32% less bread, 5% less potatoes, ⅓ less coal and ⅓ less letter postage than in 1913

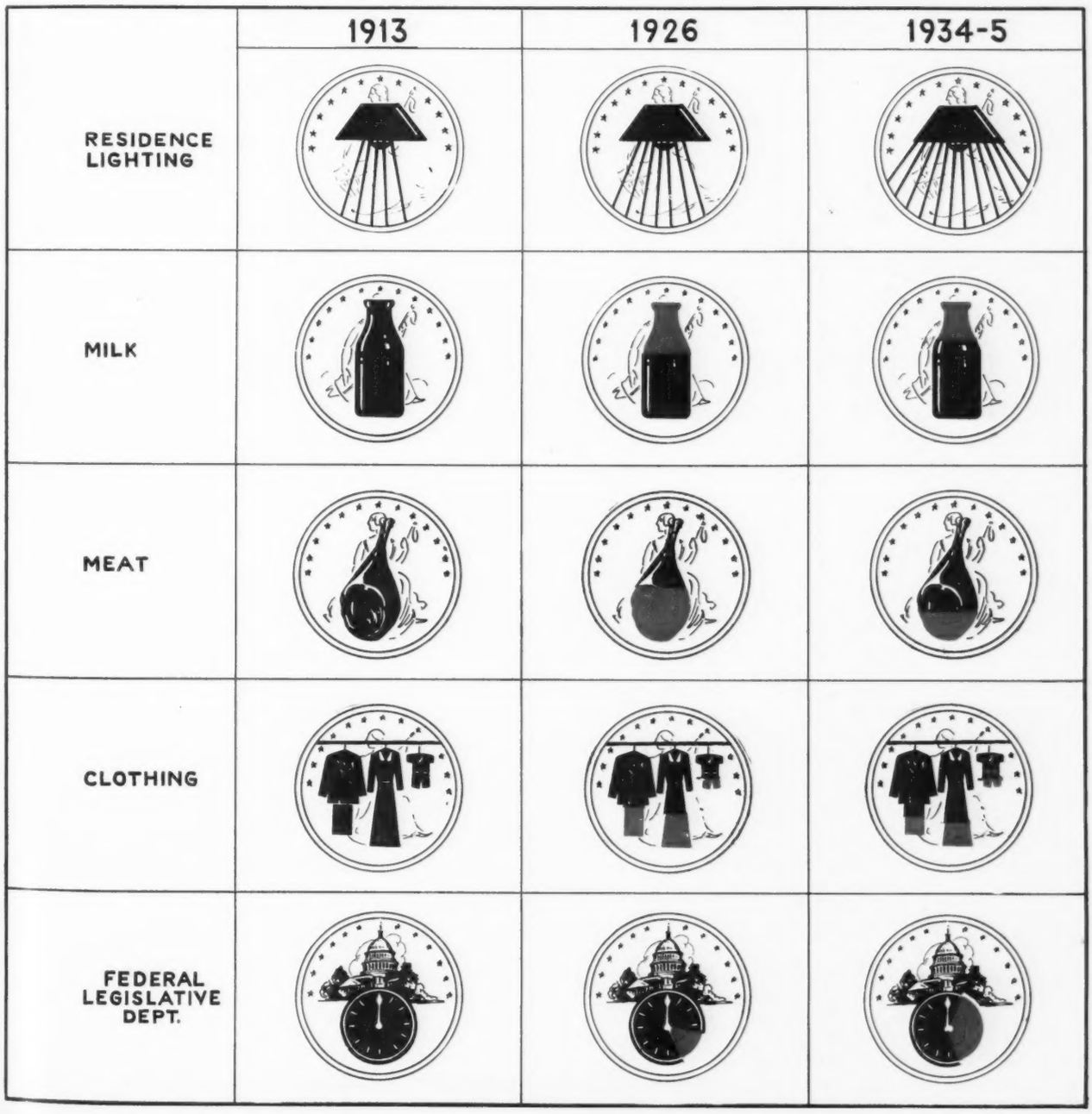


MORE FOR THE DOLLAR

1⅓ More Light Today Than in 1913

the Dollar Buys of Other Things

The dollar buys 1⅓ more light, but ¼ less milk, 30% less meat, ¼ less clothes and 38% less congressional time than in 1913



Electricity Rates Explained

Modern Rates Prompt the User to Use More
Forms of Rates Nearly as Simple as They Can Be Made
Savings by Diluted Costs Show in Lower Rates for Increased Use

ELECTRICITY has little use for war and little interest in it. But electricity does bear in mind the recent never-to-be-sufficiently-remembered affair for a single reason. It is a statistical one. The war, whose shells were turned by lathes driven by electric motors, disrupted the most sacred, sacrosanct, absolute statistical base of the whole industry. Only war costs could have made rates go up while use was going up. For it would appear to be a law of nature, rather than a habit of the tribe, that just as electricity *use goes up* so do *rates go down*, in a parallel, beautifully mathematical fashion, one of those curves, which seen at textbook age, one can never forget.

Master clinicians of business health have discovered that this is one of the health signs of a body that is vigorously aggressive. It is the industries that go after business with greatest aggression that are most sensitive to this law. Hence we need have no fears that the coming tremendous effort of the electric industry to sell more of its products, energy and appliances will defy the fundamental rate law as the war did. It made electricity go up in price when everything was rising. Never before, never since, has electricity gone up in price, whether other things were going either up or down, good times or bad times.

Rates all go back, of course, to the painful—or perhaps fortunate—provision of the universe that electricity cannot be stored. Forever restless, therefore, purest of energies. Since it cannot be stored its creation costs are diluted when the apparatus is set to work more hours of the day. Similarly and logically, its financial charges are diluted. For the interest on the debts back of the great machinery works nights and days, Sundays and holidays. It would still be work-

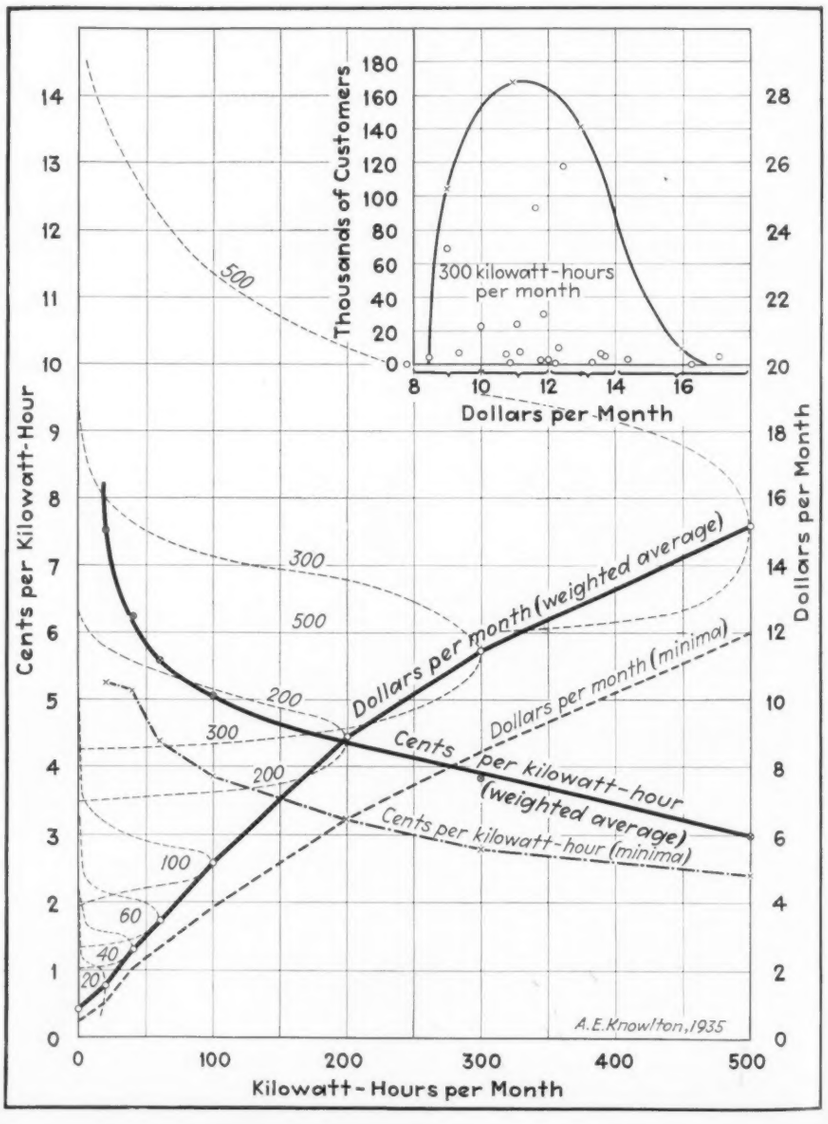


Fig. 1—Household rates gaged to promote residential usage

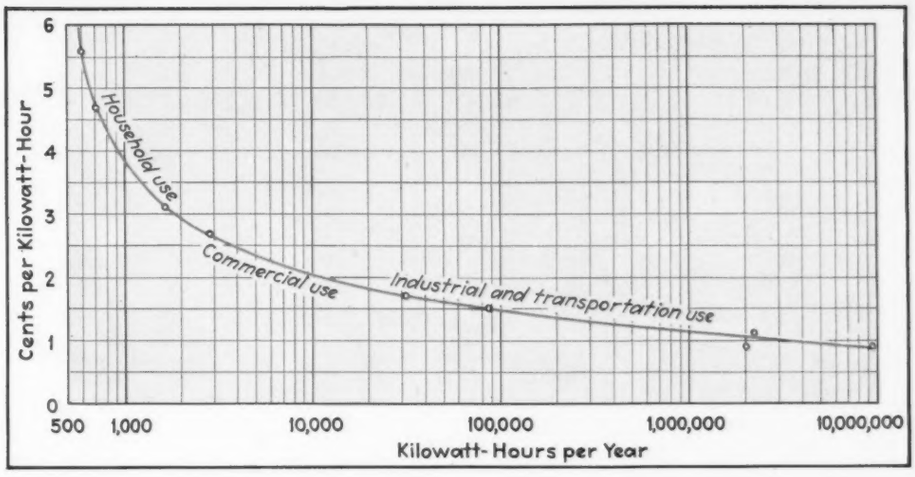
This chart analyzes the various rates paid by 500,000 customers in one state. For any given consumption shown on the bottom of the chart more customers can buy their electric service at the monthly bill shown on the "dollars per month" curve than at any higher or lower figure.

The dotted "hump" curves at the left show the proportional number who would pay at these higher or lower rates than the most frequent charge indicated by the curve.

The inserted curve in the upper right explains how the "frequency" curves were obtained for each amount of consumption. The number of customers who, under the existing rates, would pay various amounts for 300 kw.-hr. per month were computed from the statistics of the state public service commission and then bracketed into $2 blocks to determine the total number averaging to middle-of-the-block dollars.

Fig. 2—Electric rates reflect law of "low price for large volume"

U. S. Census data (1932 operations) for electrical industry. Points are for average consumption and average rates for various national classes of customers (residential, farm, industrial and railway) served by both private and municipal plants.



ing just the same if through some aberration of our local solar system we had a run of three days sun without night or a week-end of total darkness. The cost of electricity is not as that of every-day commodities, a mere supply and demand matter; it is supply and demand dictated by the more austere laws of physics.

A rate is a posted, approved price that rules for some little time—the same for everybody. A lot of thought is expended upon it and within its magical arithmetic is hidden a complex of all the policies that the rate offerer, the rate approver and the rate payer can possibly rationalize. The time was when the rates for small users had to be high because small users were the only ones who used energy. Profits, even though reasonable, had to come from somebody. Today there are large users who used to be small users and the little users are being served at a loss. But the whole business pays reasonably. There are fewer small users, relatively. Some of them grow. The big users grow bigger. Those that don't are just carried along by the ones who have grown. Which is all right. Nobody can be left blind or powerless.

Customer charge substantiated

It costs—proven many times to regulatory satisfaction—from 60 to 100 cents a month just to keep track of a customer. The paper-shuffling connected with him runs into that much. His meter has to be read, even if it is motionless. It has to be tested to see if it still reads, and reads right. He has to get bills. He can complain, too, for the most annoying little catastrophe can happen to the smallest electrical unit he uses in his home. Trouble shooters have to be ready for all sorts of things. The law of electricity forbids to the poor as to the rich that their lights should go out.

Nobody remembers any more what great artist first created the immortal phrase "readiness to serve." It must have been a philosopher or some great judge, for it expresses the whole basis of an industry that has become our very life. What cannot be stored but which must always be there! It is that which determines the capacity of the plant. Investment is fixed by it. And the government, Federal Power Commission as its mouthpiece, has held that each and every customer very properly shares in the inexorable burdens that it imposes. The transformer on the pole has to be big enough to supply the most energy that all the customers served by it choose to take at any time. Generators at power houses and everything between them and the transformer have to be big enough to meet the combined demand of all kinds of customers—industrial, commercial, street lighting, railway, residential.

These are the factors that govern the amount of investment that utilities have to make. It must be capable of rendering a locally universal service. Enlarged use by a given customer usually means more hours a day of service. Then the rate can be lower and is lower. The rest of the lowering of costs and rates is due to more engineering skill, wonderful in itself, but small as compared to a law of nature. Less coal burned, better mechanical design, better technical management. All very well, but minor. The great thing is to make the invested dollar serve more kilowatt-hours. Eighty per cent of the cost of the energy is in the readiness-to-serve plant, only twenty is in fuel, man-power and other costs that enter with use.

There are 3,600 separate, individual, disconnected enterprises in the American utility scene. Look at the curve in Fig. 2. The relation between use and price could not be as there correctly shown through any conspiracy of the 3,600 utility managers, all in accord. The fundamental law is there at work. It is of the very religion of electricity.

From the middle of the commercial-use region of this curve on to the extreme low end, the public utility service has to compete with what it would cost the customer-proprietor to make his own power on his own premises. Prospective costs for such a user have to be definite before he will commit himself to purchase. The industrial, commercial or railway user wants to know how much it will cost him as an irreducible minimum and how much more it will cost when he expands his own business operations. The customary rate gives him this on the form of a demand charge and an energy charge. The (poorly named) demand charge tells him how much he is paying to support the investment made to take care of the greatest draft he makes on the system. The energy charge informs him how much his bills rise because he extends his use over the hours.

Most fortunately the very rate form which gives the large industrial user the information he most wants is in wholesome keeping with the non-storage economics of electricity already mentioned. The demand charge is to recover for the utility the carrying charges on investment made for the respective users of each class, because the energy cannot be stored during slack hours, but must be backed up by generating equipment large enough in the aggregate to deliver what is wanted at the moment when it is wanted. Whoever could remold the behavior of electrons so they could be packed

How Increased Consumption Dilutes Costs

(Costs are characteristic of nation-wide residential averages; not a specific instance)

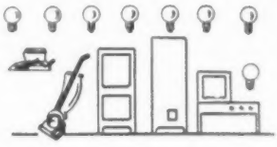
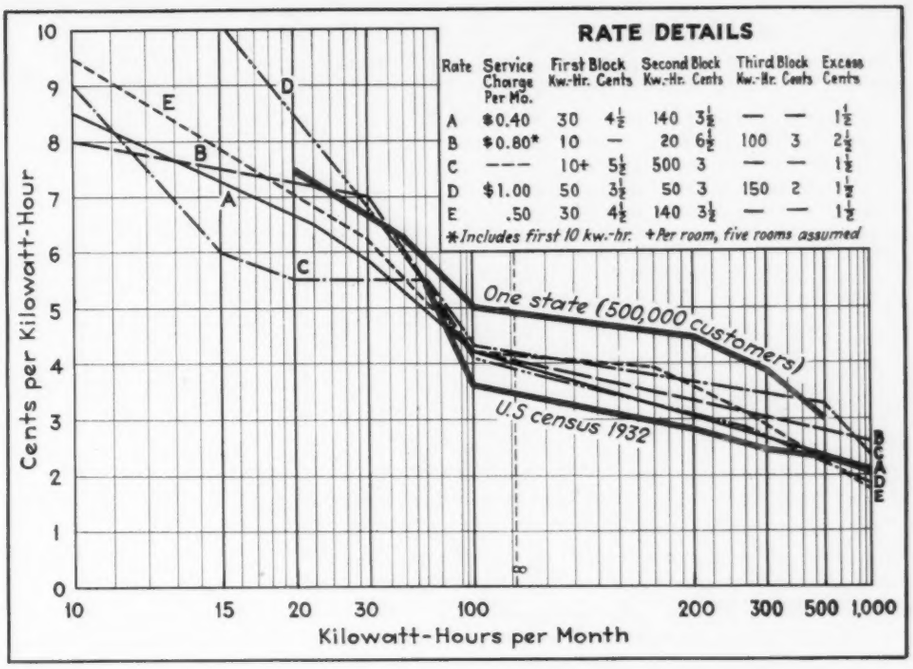
When used for			
Kilowatt-hours per year	240	600	3,000
Kilowatt-hours per month	20	50	250
Bill per month	$1.60	$2.50	$5.63
Cents per kilowatt hour	8¢	5¢	2¼¢
The Bill Covers			
Power Plant Investment	$0.18	$0.37	$0.72
Operating the Power Plant	0.10	0.22	0.85
Transmission and Substation	0.15	0.24	0.38
Distribution Investment and Operation	0.53	0.83	2.65
Customer Service, Trouble Call, Etc.	0.08	0.14	0.20
Commercial Space and Expense	0.29	0.40	0.50
Reading Meters	0.07	0.08	0.09
Billing	0.14	0.15	0.16
Collecting	0.06	0.07	0.08

Fig. 3 — Multiplicity of rate forms can be devised to conform to economic curve

These five sample rates were cited by the Federal Power Commission in its Rate Survey report to show how different forms of rate devised to charge between the narrow limits of $4.20 and $4.35 for 100 kw.-hr. per month would vary somewhat for other consumptions. They differ little in the large consumptions, but do so quite a bit for the very small users. Note how they all trend toward one cent for the usage well above the 1,000 kw.-hr. point. The plot is on reciprocal paper, which tends to convert the curves of Figs. 1 and 2 into straight lines.


RATE DETAILS
Rate | Service Charge Per Mo. | First Block Kw.-Hr. | First Block Cents | Second Block Kw.-Hr. | Second Block Cents | Third Block Kw.-Hr. | Third Block Cents | Excess Cents
A | $0.40 | 30 | 4½ | 140 | 3½ | — | — | 1½
B | $0.80* | 10 | — | 20 | 6½ | 100 | 3 | 2½
C | --- | 10+ | 5½ | 500 | 3 | — | — | 1½
D | $1.00 | 50 | 3½ | 50 | 3 | 150 | 2 | 1½
E | .50 | 30 | 4½ | 140 | 3½ | — | — | 1½
*Includes first 10 kw.-hr. +Per room, five rooms assumed
Cents per Kilowatt-Hour
Kilowatt-Hours per Month
One state (500,000 customers)
U.S census 1932
BLADE
A
B
C
D
E

nicely and serenely in storage tanks would revolutionize the whole business of making and charging for electricity.

Incidentally, these users of, say, 10,000 kw.-hr. per year and up also have power factor and coal clauses and primary voltage charges and credits on their bills. Complex, yes, but all part of the intricacy of electrical economics. None of these rate elements has been injected just to satisfy a craving for confusion on the part of rate experts. They are there only because they serve to resolve into unity the differences between customers whose use habits differ widely, although general volume of use would appear to make them fully comparable.

When it comes to the householder and the small commercial user the situation is quite different. It is not so different in the factors represented in the cost of delivering the service, but it is quite different in the way the service is charged for. The industry knows full well that household rates are likely to appear complicated enough anyhow—because electricity is what it is—without charging the householder on the same multi-element charge which the larger users are accustomed to and understand. For that matter the "demand" of the little user in the home is of relatively small importance as compared with the so-called per customer costs grouped at the bottom of the accompanying chart. Consequently, home-use rates have to find another way to drop the price as the use goes up, all in accordance with the fundamental law of Fig. 2.

The block rate, with or without an initial charge, is the growing method for doing this. The first and third figures, especially the third, with its inserted rate tabulation, show how this is effected. Such a rate not only does justice to the small and medium user by charging enough to make the very smallest user almost self-supporting, but it drops the rate for the user who is disposed to move on upward into larger blocks—he sees that he gains every time he increases his use. Finally, this form injects a definite inducement feature by setting a low rate for all use above a certain level. In four of the instances shown in Fig. 3 the "excess" rate of 1½ cents per kw.-hr. is available after between 170 and 500 kw.-hr. have been used at somewhat higher rates.

Now see Fig. 1. The same tapering characteristic exhibited for all classes of users works out within the range of consumption into which the great mass of householders fall. It is the weighted average price for 500,000 householder-type customers in a single state, where 169 towns are served by 31 well-divorced private companies and municipal enterprises under 100 divers and different rate schedules!

We will not here go into the fairness of these cited and illustrated rates. That was up to the local regulatory bodies. We are trying to write here about the forms rather than the level of rates. Everything is relative. Even fairness is relative to those to whom somebody has been fair or unfair. Why, then, are rate forms what they are? These principles govern in the planning of a rate:

1. Collect nearly enough from the small user.

2. Earn a fair return on the whole volume of business done.

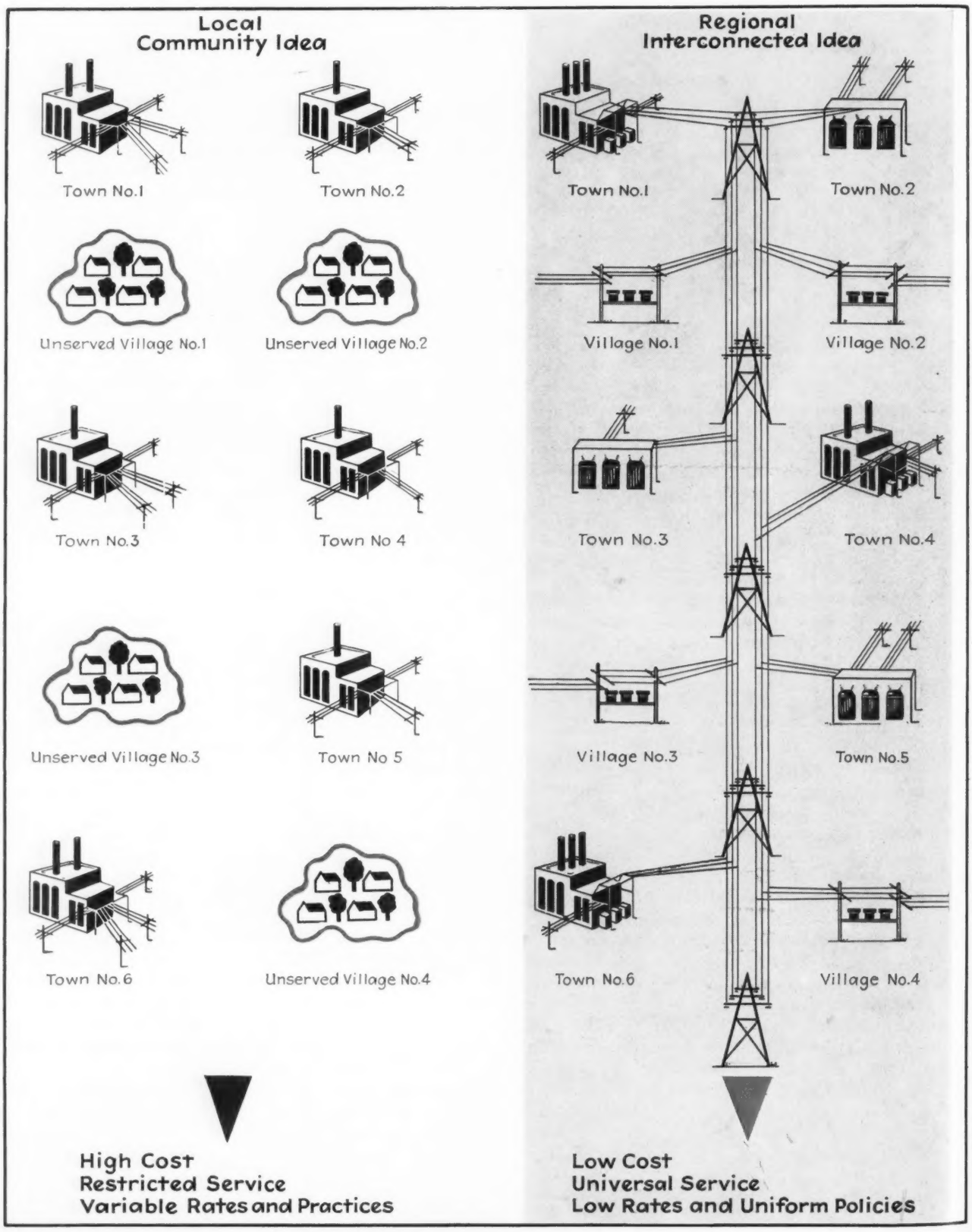
3. Shade the price for large volume usage to the point where that use will be stimulated.

Please see Fig. 3. Here are five rates: San Francisco, Charlotte, Memphis, Asheville, Sacramento. All are for monthly bills for a five-room house for 100 kw.-hr., even if they are not identical for less than that or more than that. All create bills of from $4.20 to $4.35 for the 100 kw.-hr.

The significant point in this interesting comparison is that all these rates are headed downward more abruptly than is the census average. Four of the five plotted there have a base rate of 1½ cents per kilowatt-hour. It begins at as early a value as 170 kw.-hr. per month in two of the five instances. In one case it is available after 60 kw.-hr.

With rates designed like these typical ones it is simple to hold the rate up where it has to be for the very limited user and bring it down to an attractive level for the large user so as to stimulate greater and greater use. There are today 46 cities where 500 kw.-hr. can be bought at 2 cents or less. There are 127 where this use gets the customer a rate of 2½ cents or less. Just below the 2½-cent line there is a flock of goodly towns, and rate reductions are reported weekly.

The Holding Company



as a Factor in Progress

Started as a Financing Aid
Developed Into a Service Organization
Changed Services with Changed Conditions
An Example of Holding Company Finance

WHAT do the holding companies contribute to power supply? Should they be abolished? Should they be regulated? How will they help carry out the proposed recovery program of the electrical industry? No discussion of the electrical industry is complete without facts about this much maligned and greatly publicized factor in the electrical industry.

The holding company is the ministry that gives unity to the utility industry. It represents the constituent elements and brings them together in policy, finance and management. The story of the holding company is a drama of economics, growth and service despite a trickle of abuse from within and a flood of abuse from without the industry. Holding companies came into being because America as a consumer was ready for electric service, but America as an investor lacked faith in small enterprises. They and they alone made possible our present abundant and inexpensive power supply. Residents and workers in countless towns, villages, farms and many cities enjoy the advantages of electricity and benefit from the contributions of the holding company without a knowledge that they, far more than the investors, are reaping what the holding company sowed.

Functions, organization and policies of holding companies change and are changing. Individual instances of abuses have been recorded and there is no disposition to condone or belittle them. But the truth is that the holding company has been necessary, and on the whole has a record of accomplishments in the public interest of a caliber only dimly recognized. Holding companies should be regulated and not destroyed. Legitimate holding companies welcome fair regulation.

Why they grew

What was the underlying reason for the growth of electrical holding companies? The answer must go back into the history of the industry. Power supply began in small cities with local companies. The money necessary for extensions was advanced by the owner, borrowed from the banks on short-term notes or borrowed from electrical manufacturers. The idea was that this money would be paid for out of earnings. Mortgage bonds of the closed type were issued to the amount the owners thought would be needed.

Then what happened? It took several dollars of investment for each dollar of increased income, expansion was so rapid that new money for investment was needed in larger volume than revenue increased, the closed type of mortgage bond limited security issues. There was a deadlock. Money was difficult to get and expansion was so rapid that there was no possibility of paying money back out of earnings fast enough to keep pace with maturities.

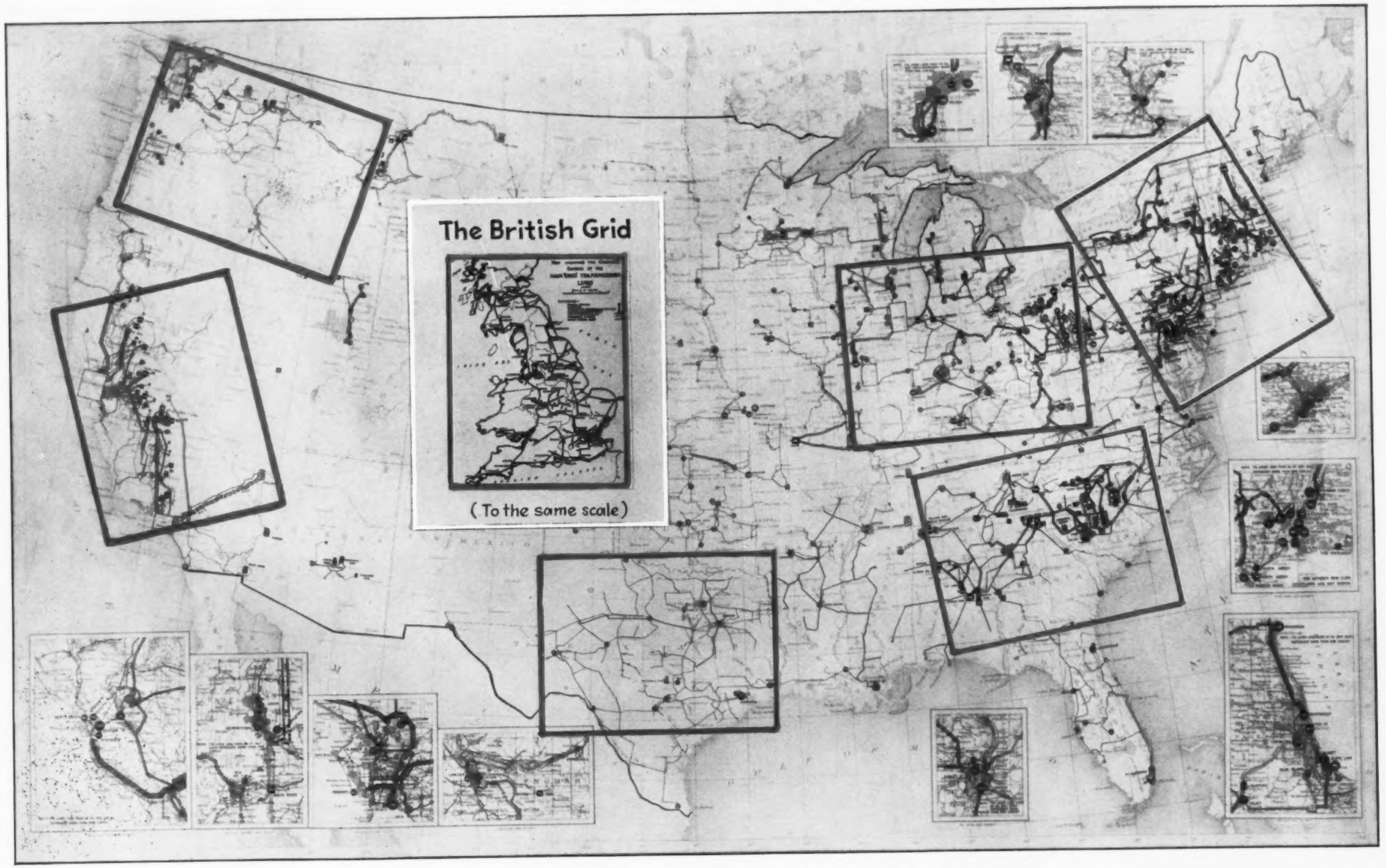
A second factor was that only the companies in large cities could serve large power users, such as industrial plants. Small communities and villages did not have adequate power facilities and could not interest industrial plants in electric power supply.

RETURNS UPON SECURITIES VARY WITH EARNINGS

(An illustrative operating and holding company capital structure based upon $100,000,000 investment)

Investors	Type of Security	Amount	Rate	Returns Upon $100,000,000 Property Investment		
				7% Over All ($7,000,000)	6% Over All ($6,000,000)	5% Over All ($5,000,000)
Banks, insurance companies, trust companies	Mortgage bonds of operating property	$40,000,000	5%	$2,000,000	$2,000,000	$2,000,000
Moderate risk investors in local properties	Preferred stock of operating properties	$30,000,000	7% if earned	$2,100,000	$2,100,000	$2,100,000
Equity investors, holding companies, investment trusts	Common stock of operating property	$30,000,000	Variable	$2,400,000 (8%)[1]	$1,900,000 (6.3%)	$900,000 (3%)
Moderate risk investor in diversified property	Holding company[3] preferred stock	$15,000,000	7% if earned	$1,050,000	$1,050,000	$900,000 (6%)
Equity investors and investment trusts	Holding company[3] common stock	$15,000,000	Variable	(8%)[2] $1,250,000	(5.7%) $850,000	Zero

[1]Reserves of $500,000. [2]Reserves of $100,000. [3]Assuming a holding company owns all the operating common stock.



We Have Six or More Grids Like the British Grid

Interconnection on a regional basis, fostered by the holding companies, has created several grids comparable in magnitude to that of the British system. Theirs was patterned after ours. The equivalents have been added to this recent Federal Power Survey map

Interconnection on a regional basis, fostered by the holding companies, has ... British system. Theirs was patterned after ours. The equivalents have been added to this recent Federal Power Survey map

That was the period when the farms were being deserted and all industry was moving to a few congested industrial areas. Outlying residences and farms could not be served. Electric power supply consisted of local power supply units, each with its own facilities and each affected by the ups and downs of business in its own community. Credit, depending upon local earnings and recognition, was difficult to get in the large money centers.

Something had to be done to remedy matters. The financing company was the answer. The utility men who organized these financing companies knew of the troubles and handicaps of the local utilities and knew how to overcome these handicaps. The logical way to get investor credit was for the financing company to retain securities of the local utilities in exchange for money advanced for expansion. These local properties were usually diversified geographically as to territory served so as to get stability in earnings. This was the way in which the financing company became a holding company. Holding company securities based upon such diversified portfolios proved attractive to investors and provided the capital advances to the operating properties so that they might expand and overcome many of the handicaps resulting from closed or limited mortgages. Advances to the operating companies were financed at propitious intervals and the credit of each subsidiary was strengthened by reason of its affiliation with the holding company.

Holding company adds supervisory functions

But this financial stage rapidly expanded into greater service functions. It became logical to group together local properties in each region so that full advantage might be taken of economies in producing and delivering power, so that all the area could have an adequate power supply for home and industry and so that management, finance and operation could be consolidated and made uniform. All this meant reduced costs for service and an amplification and improvement in service to large areas. This was the stage of regional power supply that later developed into the great superpower systems.

As a logical evolution the holding company grew and expanded and afforded direct services to operating utilities. Some of these were and are:

1. Services of a staff of corporate officers who are often also officers of the operating utilities so that management specialists are available to the smallest as well as the largest subsidiary.

2. Services of a financial and legal character by a competent headquarters staff. The drawing up of mortgages, issuance of securities, compliance with federal and state laws on financing, negotiations of contracts, purchase and sale of local utility properties, rate research and rate making and many other tasks were done by broadly experienced and competent men.

3. In the era of rapid expansion, engineering and building facilities was a big job and holding company construction men and engineers designed, supervised and frequently constructed the major system additions for all the subsidiaries. This gave uniform and modern installations and low-cost purchasing to all subsidiaries. Many technical problems were of an intricate nature and called for experts and research which individual companies could not afford.

4. Services of an auditing department were placed at the disposal of operating utilities. Parallel service in insurance, tax return, financial and property records were given.

5. Many items of current supply and construction can be purchased at a discount by volume buying and savings may also be made by standardizing purchasing. This service was a logical development in many instances.

6. Since utilities are in business to sell their service, many holding companies established commercial service departments to aid the subsidiary properties get more load, get new industries to locate on their systems and, in general, to aid in sales and sales promotion. The rate department was invaluable in this work.

In several instances these holding companies proved so competent to aid local properties that they were retained as management organizations at a fee by companies in which they had no financial interest. No two holding companies developed in the same way or had the same organization, but the general situation has been outlined to show that they came into being in response to a need and that their work was in the public interest. They brought the utility business in this country to a perfection and scope far ahead of that found in any other part of the world.

Today the holding company has arrived as an economic entity of importance in the life of the nation of investors and consumers and workers. Wicked persons in a few instances have made characteristically wicked uses of this indispensable tool. And so they have of about every other useful institution. The watering of stock, speculative sprees and all sorts of dark things have come up from time to time, just as graft, personal aggrandizement and other evil things crop up in government itself occasionally. But the uses of the holding company far outweigh the abuses. The uses are stability of earnings throughout a large business through the pooling of the incomes of many small businesses and services; the capitalization of diversity in earnings, activities and areas; common policy on operations and on practices; the affording of uniform, extensive and economical power wherever power is needed, wherever there is a fair chance that it will some day pay to install or send it thither. Then there is the concentration of skill and experience in management, qualities sufficiently rare in the new industry of electricity to find them husbanded zealously.

Holding company finance has little of anything to do with rates paid by customers. Rates are, and must under state regulation be, based on the actual investment in the operating properties and the return upon that investment. The holding company is merely a legally proper and financially sound means of diversifying the risk of investment in operating properties so as to appeal to all classes of investors. The holding company is essentially a large shareholder taking properly earned dividends as does the small individual investor in the operating company.

To sum it up, in the development of co-ordinated areas of power supply, in the plan and institution of sales programs, such as this contemplated one, in the planning and institution of proper rates, in the raising of money for expansion, in the diversification of risk, and in many other functional activities, the legitimate holding company, and there are many of them, can aid greatly in carrying out this recovery program quickly and economically. Such companies should be and now are regulated in order to prevent bad practices, but they are essential to the intelligent and economical operation and expansion of this industry.

HAPPY COMMUNITY LIFE AFFORDED BY ELECTRIC POWER—Diversity of labor is permitted. Factory, home and farm may be in close proximity. Balanced activities avoid effects of wide fluctuation in industrial or agricultural conditions.

Place of Electricity in National Recovery

Foe of Monopoly and the Friend of Small Enterprises — Makes Positive Contributions to Social Values — Helps Solve the Paradox of Plenty

By LIONEL D. EDIE
Consulting Economist, New York

TWO successive Presidents belonging to different political parties have seen the importance of a broad and fundamental approach to the problem of recovery. President Hoover appointed a National Committee on Social Trends and President Roosevelt more recently appointed a National Resources Board. This approach goes far beyond any partisan purpose or political advantage. It is a recognition of the fact that the time has come to visualize the picture of our national life in its entirety.

Some people shrink back from this approach, because they fear that it represents the desire to establish a "planned economy." It is true that many authorities hope to derive from such broad studies the elements of a planned economy. Nevertheless, they represent only one point of view. There is another point of view, one which wishes to make available broad information for use in shaping our national affairs, but which is not interested in planning as such.

It is this latter point of view which colors the present article on national recovery. In brief, the United States today is undergoing many fundamental changes of economic and social character. A wide variety of forces are making themselves felt and many of them are disturbing to old, established ways of doing things. The only hope of turning these forces into constructive channels is to understand as fully as possible what these forces are and whither they are tending.

One of these great forces is the use of power, and one of the primary sources of power is the electrical industry. The present discussion, therefore, is dealing with only one segment of the total problem. It is dealing with this segment, not as an isolated case, but as a part of the whole.

Consequently, these introductory remarks have attempted to paint the broad background of the problem. They have attempted to catch the spirit of both President Hoover and President Roosevelt in appointing the national commissions.

At the outset the discussion of the place of electricity in the national recovery is handicapped, because the whole electrical industry is under political attack. At the moment public opinion is agitated on the political side of the question. It is frightened by public ownership of great hydro-electric projects, by threatened municipal competition with private facilities and by proposed legislation to regulate or eliminate holding companies. Although full recognition must be given this political uncertainty, nevertheless this present analysis will have to do mainly with the economic side of the question. To some people it will appear impossible to discuss the economic side without being drawn into political arguments, but such is not necessarily the case. In fact, there is much to be gained by focussing attention upon the electrical industry as a great economic force.

In order to make the discussion simple, clear and definite it is necessary to present the picture in the form of a series of points. These may be taken up in one, two, three order. Each point is singled out and numbered in order to show how the electrical industry reaches out and touches our national life in that particular channel.

1. *The electrical industry provides a dynamic element of economic growth and expansion*—For several years economists have said that what the country needs is a new industry to pull us out of the depression. Accelerated expansion into the unfilled electrical markets is such a new industry. It contains the potentiality of doubling or

even tripling the per capita consumption of electricity within a reasonable period of time.

This will require increased use of electrical appliances in every industry and in every home, and eventually will require expansion of generating and transmitting facilities by the power industry. All of these appliances are capital. Their production and use employ labor.

Purely as a matter of "time," the electrical industry is an old industry. But this should not conceal the fact that when any industry substantially cheapens its product and goes after a new market it opens up tremendous new fields of consumption. Cheap power is an application to electricity of the principles which Henry Ford applied in the automobile industry. Thanks to the Ford idea, there are in the neighborhood of 23,000,000 cars in use in America today, and the use of an automobile has been made an every-day necessity for the average man. No other country in the world has even approached the degree of saturation in the automobile market which prevails in the United States. The electrical industry appears now to be on the threshold of a similar growth and expansion. It is no exaggeration to state that the electrification of this country is still in its infancy. The potentialities are limitless. Consequently, the electrical industry is a dynamic force for recovery. It probably has more potentialities than any other industry.

Permits industrial decentralization

2. *Electricity is a natural foe of monopoly and a natural friend of little, independent business*—The question of monopoly has recently come to the front of national attention because of the effect of NRA. The Darrow report savagely attacked NRA as a builder of monopoly. Senator Borah and other political leaders have attacked NRA on the same score and have entered a plea for enforcement of the anti-trust laws and for preservation of the life of the little fellow.

A generation or more ago our great industries were built up in proximity to the sources of power. The chief source of power was coal; therefore, the axiom that industry follows coal.

Electricity has made it possible to obtain power cheaply at points far removed from coal mines. It is now possible for a small, independent business to establish itself in almost any part of the United States and to obtain power about as cheaply at one point as at another.

Cheap power is probably a greater force for the salvation of the small, independent business man than any kind of new legislation which can be written into the statute books by Congress. It is a natural force. Without it the independent producer would be working under a grave handicap, no matter what legislation was on the statute books.

3. *Electricity affects the population problem by acting as a force of decentralization*—During the past generation there has been a marked tendency toward rapid increase of urban population and toward congestion in big cities. This tendency reached a peak in 1930. During the last few years there has been a reversal of the tendency and a consequent shift of population from city to farm. Officials charged with the task of solving the unemployment question have developed theories of decentralization. The subsistence homestead is one illustration. There is recognition of the fact that many families can be at least partially self-supporting by having a small stake in the land, and government agencies are trying to facilitate such migration. Whenever they make these attempts the question arises, how can a family so transplanted be given a certain amount of factory employment to provide cash income. The question can be answered only by establishing relatively small factories outside metropolitan areas. The establishment of these factories is facilitated by cheap electric power.

Electricity enables small units to operate in many lines of industry on as efficient a basis as large units, and in many cases on a more efficient basis than large units.

These great movements of population are slow and drifting in character. No dictator can force millions of people abruptly to change their homes and livelihoods. On the other hand, there are certain fundamental natural forces constantly tending to bring about shifts in population. Electricity is a natural force facilitating decentralization, thereby fostering a higher degree of stability and of security.

4. *Electricity offers a solution to the paradox of plenty*—This it does by three main lines of influence:

First of all, electricity is itself to be regarded as a commodity available on a scale of plenty. By making electrical energy available in abundance and at a low price the industry brings the convenience and service of this commodity within the reach of the average man. It relieves the housewife of drudgery and adds to the comfort and enjoyment of home life. It enables the masses to benefit from what in previous periods has been a luxury beyond their grasp. In this respect it raises the standard of living of the whole people and makes the age of plenty a reality for them.

In the second place, it facilitates mass production of all forms of manufactured goods at a level of cost within the ability to pay of the lower income groups. It helps to lower the cost of the daily necessities of life and, consequently, to broaden the market for those necessities.

Adds to purchasing power

In the third place, the electrical industry, through its own growth and expansion, provides employment for labor and thereby creates purchasing power. This purchasing power in turn enables labor to buy more and better clothing, food and other articles of merchandise, thereby absorbing surpluses in consumption.

Electricity alone cannot solve the paradox of plenty, but in its own sphere it offers an important contribution to the solution. By so doing it acts as a helpful agent in restoring proper balance between supply and demand in the entire national economy.

5. *Electricity is an economic force operating against excessive inflation*—During the past two years of a rising cost of living, electricity is one of the few articles of commerce which has steadily declined in price.

In the midst of a régime of inflation, this one basic commodity has continuously shown a trend toward further deflation. This trend has been harmful to certain classes of security holders and there is no attempt in this discussion to condone unfair treatment of security holders. But it is proper to point out that consumers have had electricity made available to them at deflated prices.

It is true that the average consumer's monthly bill for electricity is not a huge sum in itself. Politicians have undoubtedly exaggerated the importance of electricity in the monthly budget. Nevertheless, the consumer has become highly conscious of this item in the budget and has a keen desire to obtain more for his money. He

has responded to deflation of price by installing new electrical appliances. Hence deflation in this field is important practically as well as theoretically.

At a time when the financial world is worried about inflation, it is significant to note that the electrical industry has been a force in the opposite direction.

6. *Electricity is a prime factor in revival of the capital goods industries*—In order to attain a balanced recovery the capital goods industries have to come back to life. The bulk of unemployment existing today can be traced to the slowness of these industries in emerging from the depression. Electricity invites three major forms of capital expenditure:

First, it requires electrical appliances for household use. Sale of appliances can be financed by installment credits, thereby creating credit expansion and utilizing excess bank reserves. Second, it requires electrical equipment for modernization and repair of factories, railroads and other lines of enterprise. Corporations put their depreciation reserves to work by purchasing such equipment. They are under pressure to install the equipment in order to meet competition. Third, the utilities themselves require new equipment for generation and transmission of power. This step has been slowed up by the political uncertainties surrounding the industry, but as soon as the climax of the political attack has passed the utilities will come into the market for new heavy equipment. Installation of such equipment usually occupies a period of one to two years; hence utilities have to plan well in advance of their expansion requirements. A reopening of the market for new bond issues will be necessary before adequate financing of heavy capital in this field can be assured.

7. *Electricity offers a positive contribution to the social values of American civilization*—While redistribution of wealth and income is debated in books, newspapers and legislative halls, the electrical industry seeks to bring the luxuries, comforts and necessities created by modern science into the daily lives of millions of people hitherto without those privileges. This is a process of adding to the wealth of the average man without robbing Peter to pay Paul.

There is much loose talk nowadays about "revolution." The word is figurative, but it usually implies a violent destruction of old ways of life and an abrupt introduction of new ways. As against these conceptions of "revolution," one is warranted in turning with approval to that kind of revolution which is being effected every day in our social life by the many variations of the electrical arts. The radio converts the farm household from an isolated existence into a forum of public discussions and a theater of music and entertainment. The refrigerator and the hundred and one forms of household appliances revolutionize the toil of the housewife. Public opinion becomes highly sensitive to new waves of ideas, or to new hysterias, as the case may be, thanks to the link between modern facilities of communication and modern techniques of propaganda.

It is unnecessary to add illustrations. The environment of family, of office and of factory is reorienting itself to the age of electricity. To double the use of kilowatt-hours is a cold achievement when stated statistically, but who has so little imagination as to miss its significance in terms of improved use of a nation's leisure time and of binding together with common interests the highly sectionalized life of America?

The realization of these values can be greatly aided by a broad conception of responsibility on the part of government and of utility management. The government has a constructive task to perform. It can regulate within reason, and yet not intimidate and harass the utility operator, who is going about his daily task in honest intent and courageous enterprise. It can create useful employment in the development of natural resources and yet not use this weapon to destroy freedom of initiative on the part of the private operator who is lowering rates and building consumption load with every energy at his command. It can check abuses of capital structure and yet not demoralize the capital markets to a point where new capital dare not enter the industry.

On the other hand, private management has new responsibilities. Its great task is to build consumption by making power as cheap as possible. To carry out this task, management must do more than keep its house clean of financial faults. It must catch the imagination of the public, educate the public to the possibilities of the use of electricity, and back up its product by sound promotion.

Government and management can nowhere make a greater contribution to national recovery than by joining hands in the electrification of America. Too often have these agencies seemed to think of themselves as natural enemies. How unfortunate! They are partners—partners in the adventure of bringing the greatest discoveries of modern science into the daily lives of the people. Both must do their part, neither must fail to rise to the occasion.

Electricity—A Reconstruction Asset

BELOW THE SURFACE of the underbrush that is visible in the political, financial and legislative forest lie the roots that feed and control our economic and social characteristics. Real underlying forces must be obeyed as well as followed if balance and prosperity are to be secured and maintained. Power and its use is probably the most potent agency now at work in home and industry to reshape our affairs.

In this article Dr. Edie measures this force and points out clearly what it may be expected to do if used intelligently and abundantly. This is not a "planned economy" approach. It is based upon the use of the information available about a relatively new and powerful instrument.

Power is the key to an "economy of abundance" and a life of comfort and happiness. There is no limit to its production or to its use. It influences everything we do, and many of our present maladjustments continue because we do not follow the dictates of this underlying force. Space permitted Dr. Edie to develop this topic only in a limited way, but the points he makes are outstanding in their significance. They prove beyond a doubt that the electrical industry can and will play a major part in our readjustments to new conditions if it is given fair treatment. It is only necessary to outline the points discussed by Dr. Edie to grasp the possibilities.

1. The electrical industry provides a dynamic element of economic growth and expansion.

2. Electricity is a natural foe of monopoly and a natural friend of little, independent business.

3. Electricity affects the population problem by acting as a force of decentralization.

4. Electricity offers a solution to the paradox of plenty.

5. Electricity is an economic force operating against excessive inflation.

6. Electricity is a prime factor in revival of the capital goods industries.

7. Electricity offers a positive contribution to the social values of American civilization.

RESEARCH IN TELEVISION reprojection has developed fluorescent materials which glow brilliantly under cathode-ray bombardment, and so suggest an entirely new class of electrical illuminants,—"cold" light sources of any color and of extremely high intrinsic efficiency.

Looking Ahead

New Things Coming Out of the Research Laboratories Will Create New Products and New Industries

THE problem of getting jobs for millions of Americans can find its solution only in the creation and introduction of *new industries* and *new payrolls*. This, in turn, depends upon the continual introduction of *new inventions and new scientific discoveries* and their commercial development. How important is this factor over the years can best be illustrated by some such comparison as the following:

Take the present total of persons employed in the United States and it will be found that more than one-third of our present payrolls belong to industries that *did not exist* as such, *forty years ago*. The telephone, the electric light, the electric motor, typewriters and office machines, automobiles, sound pictures, radio and other industries created millions of jobs that would not have existed without these groups of inventions. Wipe out these modern instrumentalities and our problem of unemployment would have been serious indeed. Thus, *invention and research make jobs*. To some extent, of course, new efficiency methods and labor-saving inventions have eliminated jobs and involved shifts of employment.

But the great result of invention and research has been to create new industries and new jobs and to bestow upon the general public itself the greater comforts and conveniences of a richer life.

Radio broadcasting and the electric refrigerator industries are particular examples of the creation of new employment by setting up factories for the supply of new services to the general public. Based on such a slender invention as "a vacuum tube with nothing in it," radio in its various aspects today employs more than 200,000 people. Another 100,000 are given employment through uses of this same vacuum tube in sound pictures, long-distance telephony, medical apparatus and scientific equipment. Electric refrigerators now account for the employment of another 100,000.

This process of building new industries—and new employment for future millions—is now being taken over by organized research, both corporate and individual. New developments and new discoveries already in sight indicate that the eternal change in industry and everyday life, so sharply manifested in the last thirty to forty years, is now taking place at an even more rapid rate than ever before. Science and research are speeded up to a tremendous new tempo and new services and new processes are on the way that will enrich the lives of future generations to an extent now undreamed of.

New materials and new products are pouring from the laboratories. In the electrical field alloys of new and superior magnetic characteristics permit new designs of apparatus of greater lightness and simplicity. The new coaxial conductor, which will pass frequency-bands of several million cycles and convey several hundred telephone conversations simultaneously over a single wire, offers also new possibilities for "wired television."

New methods of power transmission are being tested in the laboratory and now seek practical test, giving promises of simpler operation, greater economies and the possibility of low-loss operation over greater distances than is now possible. The new direct-current transmission operating through electronic-tube converters and inverters would seem to utilize existing lines to full insulation limits, while affording a variety of frequencies of alternating current at the delivery end. Some of the men who have supervised laboratory tests declare that, by this new means, sevenfold distances can be covered with the same losses, as compared with present alternating-current systems. Since many large natural power sources are now out of economic reach of populations and markets, such a new system might have profound effects on our power development.

Meanwhile, growing out of the high-voltage electrostatic experiments of Massachusetts Institute of Technology, Dr. Karl Compton, chairman of President Roosevelt's Science Advisory Board, has suggested the possibility of a wholly electrostatic system of power transmission and utilization, depending upon electrostatic attraction instead of our present electromagnetic principles. Generators and motors would operate at a million volts, or so, and would depend upon the movement of charged carrier belts, while the transmission lines connecting them would comprise evacuated pipes enclosing insulated conductors. The high technical authority behind this amazing proposal, for which several hundreds of thousands of dollars are now asked, to experiment further, indicates that the (seemingly) wildest kinds of conceptions are not beyond the logic of present-day investigators.

New high-efficiency light sources may also be upon us soon, from the same cathode-ray principles. New dis-

to More Jobs

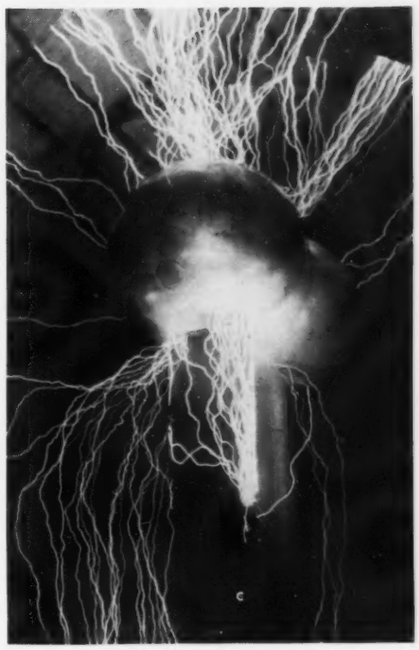
By O. H. CALDWELL
Editor *Electronics*

coveries in fluorescent materials indicate that great intensities of light production can be obtained, in a wide range of colors. This light is perfectly cold. Itself approaching the efficiency of the fire-fly, the auxiliaries to produce the cathode-ray impact are still uneconomic, so that it is held back. Meanwhile, those other gifts of the laboratory, the sodium-vapor lamp and high-pressure mercury-vapor lamp, are receiving trial installations where their high efficiencies are not detracted from by their special color combinations. At all events, from the electronic sources of cathode-ray and vapor principles, the public on a wide scale is likely to get more light for the same electricity.

Into a thousand new uses for control, for measurement, for timing, for counting, for weighing, have come new applications of the amplifying principle of the radio receiver. When it is realized that the average home radio set is capable of amplifying the faint energy that comes down its antenna, by hundreds of millions of times, one can appreciate the tremendous possibilities of this new tool in every direction of industry, science and everyday life. Measurements can be made with a delicacy never before possible. Underground objects, structure, mineral deposits and geological formations can be traced and located, without scratching the surface. In medicine and therapeutics motions of the heart and other muscles can be accurately charted for expert diagnosis. Even the faint electrical pulsations of the living brain (about 20 cycles per second) can be detected and recorded. Color changes in manufacturing-plant processes can be used as controls for vast plant machinery, so that operations become automatic. Temperatures can be regulated as never before. Time can be measured with an accuracy that surpasses all other measurements, to one part in ten million (so that today the official time of the U. S. Naval Observatory is kept by means of electronic clocks).

The "corner" behind which television has been hiding has also concealed some important and significant laboratory research. Already television has three of its principal tools in hand—the cathode-ray screen, the photo-electric mosaic with electronic scanning and the coaxial conductor which permits transmission of the wide frequency bands necessary for high-detail pictures. Needed next are practical transmitters and the money for an operating system. But with the transmitters in operation, millions of television receivers will be wanted by the public, and to build all these radio plants will have to go back to full-time operation and jobs will be offered by the thousands.

Last month, in the famous low-temperature laboratory of Leyden University, Holland, Dr. W. J. DeHaas produced nearly absolute zero, minus 459.6 deg. F. By alternately magnetizing and demagnetizing chemical salts (thus first orienting the molecules and then allowing them to swing back, extracting heat energy from the mass), he reached the all-time low in temperature. Perhaps electric refrigerators for the home will some day be built on this principle—refrigerators without moving parts, something like a transformer. Merely turn on the alternating current into the coils surrounding the refrigerant and down goes the temperature. No motor, no pump, no belt—just silent cold at the turn of a switch.



THE 10,000,000-VOLT electrostatic generator of Massachusetts Institute of Technology has initiated research dealing with "transmutation" of elements and the release of inter-atomic energy; also a wholly new electrostatic system of generators and motors, connected by vacuum pipes.

ELECTRICAL RESEARCH STARTED OR STIMULATED THESE INDUSTRIES

Industry	Stimulating Developments	Number* Wage Earners	Annual Value* of Products
Electric power utilities	Incandescent lamp, motor and electric furnaces	250,000	$1,837,046,000
Rayon and allied	Synthetic chemistry	169,567	$880,746,000
Auto bodies	Automatic welding and quick-drying finishes	150,649	$1,537,930,000
Telephone	Vacuum tubes, coaxial conductor, high permeability steel	320,763	$1,046,337,000
Radio broadcasting and communication	Vacuum tubes	130,000	$358,000,000
Sound-picture	Vacuum tubes and photo-cell	100,000	$750,000,000
Non-ferrous metal	Electric furnace	79,183	$909,804,000
Chemicals	Electrochemistry, electroplating	62,199	$738,048,000
Aluminum	Electrolytic processes	21,210	$153,457,000
Fertilizer	Electric fixation of nitrogen	20,926	$232,511,000
Aircraft	Aerodynamics	14,710	$71,153,000

Applied Research Will Develop New Processes, New Markets, New Jobs

Recovery Summary in the Markets

Utilities

NO LESS a movement than $16,500,000,000 in goods and services would occur if the electrical industry should realize in two years 10 per cent of the possible markets. A million men would be put to work. Their wages and salaries would circulate $1,000,000,000 a year during each of those two years.

HOME

APPARATUS AND WIRING
$1,690,000,000

ADDED ENERGY USE, KW.-HR.
20,755,000,000

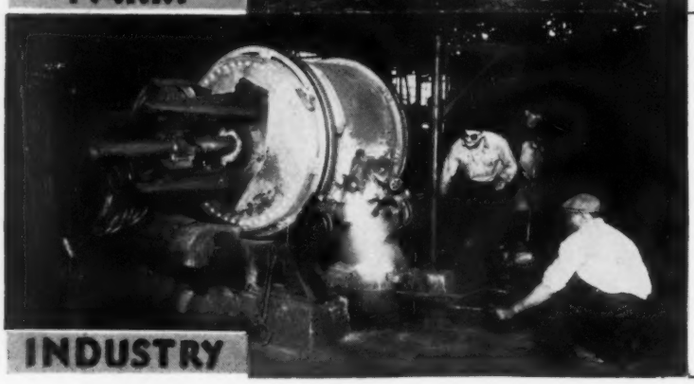
ADDED REVENUE
$415,000,000

FARM

APPARATUS AND WIRING
$484,770,000

ADDED ENERGY USE, KW.-HR.
2,938,000,000

ADDED REVENUE
$58,760,000



INDUSTRY

APPARATUS AND WIRING
$199,600,000

ADDED ENERGY USE. KW.-HR.
4,755,000,000

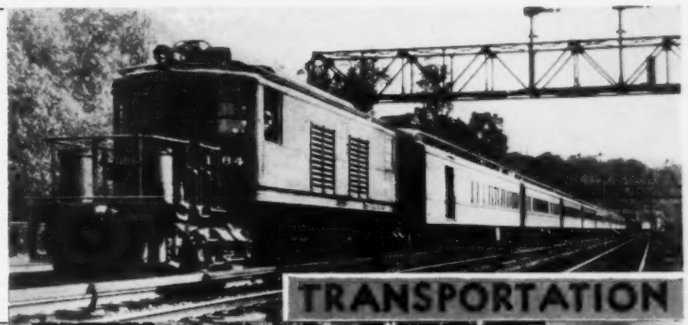
ADDED REVENUE
$42,895,000

es Can Bring This Recovery
IF They Are Not Destroyed

APPARATUS AND WIRING
$1,260,000,000

ADDED ENERGY USE, KW.-HR.
6,500,000,000

ADDED REVENUE
$49,500,000



TRANSPORTATION

APPARATUS AND WIRING
$45,000,000

ADDED ENERGY USE, KW.-HR.
1,585,000,000

ADDED REVENUE
$41,800,000

COMMERCIAL

APPARATUS AND WIRING
$124,000,000

ADDED ENERGY USE, KW.-HR.
960,000,000

ADDED REVENUE
$24,000,000

LIGHTING

Opportunity of this magnitude is nothing short of responsibility so long as recovery continues to lag.

Responsibility lies with the

Customer to act on his wants
Industry to promote the business
Utility to build to serve the business
Manufacturers, wholesalers, contractors,
Retailers to swing into sales action

And government to encourage the whole movement and permit the industry to carry out the program.

RECAPITULATION

EXPENDITURES	MEN TO WORK	2-YEAR PAYROLL
CONSUMER OUTLAY		
$3,763,370,000	.....	.....
UTILITIES FOR CONSTRUCTION		
3,021,800,000	120,000* 200,000†	$364,000,000
FOR PROMOTION		
300,000,000	15,000	30,000,000
OTHER ELECTRICAL INDUSTRY		
6,428,000,000	414,000	1,180,000,000
OTHER THAN ELECTRICAL INDUSTRY		
3,300,000,000	311,300	493,400,000
TOTAL RECOVERY STIMULATION		
$16,813,170,000	1,060,300	$2,067,400,000

*Permanent staff. †For construction.

Household Appliances

Five Times Present Values

	THESE HOMES HAVE THEM*			THESE HOMES ARE WITHOUT	
	NUMBER	VALUE		NUMBER	POTENTIAL MARKET
ELECTRIC IRONS	20,130,973	$72,500,000		1,869,027	$6,000,000
VACUUM CLEANERS	9,880,229	543,000,000		12,119,771	668,000,000
TOASTERS	9,608,239	62,500,000		12,491,761	81,250,000
WASHING MACHINES	9,439,600	612,000,000		12,560,400	817,500,000
ELECTRIC CLOCKS	8,582,500	53,500,000		13,417,500	84,000,000
COFFEE PERCOLATORS	6,474,618	45,300,000		15,525,382	108,750,000
REFRIGERATORS	6,020,000	1,020,000,000		15,980,000	2,718,000,000
WAFFLE IRONS	3,781,650	18,300,000		18,218,350	88,400,000
SPACE HEATERS	3,732,264	8,200,000		18,267,736	40,300,000
SEWING MACHINES	3,250,000	162,500,000		18,750,000	938,000,000
HEATING PADS	3,178,356	15,850,000		18,821,644	94,200,000
RANGES	1,255,750	163,500,000		20,744,250	2,690,000,000
IRONING MACHINES	905,262	47,000,000		21,094,738	1,095,000,000
WATER HEATERS	300,000	45,000,000		21,700,000	3,250,000,000
DISH WASHERS	110,000	11,000,000		21,890,000	2,189,000,000
	86,650,441	$2,880,150,000		243,450,559	$14,868,400,000

**Electrical Merchandising* data applied to 22,000,000 homes.

This Business Can Be Developed If the Utilities Are Not Destroyed

A $2,000,000,000 Home Market

AN ELECTRICAL HOME is the ideal for service and convenience, yet only a few now exist. Despite electric service to 95 per cent of the urban American homes and 61 per cent of the rural homes electricity is still used in many homes only for lighting and a few appliances. To capitalize upon the popularity of electricity in towns and get more use and more sales has been the great endeavor of the electrical industry.

An unparalleled record is found in the present accomplishment in home electrification, but when this market still offers an increased energy use of some 9,200 kw.-hr. and product and wiring sales of $1,000 per average home, there is every business reason to intensify sales activities in the home market. The possibilities are staggering to behold. Social reasons unite with the business opportunity to make the electrical industry concentrate upon the homes of this country.

It must be realized, however, that more is necessary to get electrified homes than available electrical products and reasonable rates for service. Home dwellers are creatures of habit and all the art of good merchandising is required to get them to change from their present practices to the electrical way of doing things. This is a lesson well learned by the electrical industry.

A home renter on Staten Island living in a 7-room house decided to have a reasonably well-electrified home. This home was described in ELECTRICAL WORLD of January 16, 1932, and the total price paid for equipment and wiring was $1,467. This home owner used 10,000 kw.-hr. per year and paid an annual bill of $254, or at the rate of 2.54 cents a kilowatt-hour. He was in moderate circumstances and was well pleased with the investment and the service.

This was not an elaborate electrified home. It contained a range, water heater, refrigerator, dishwasher, room heaters, radio, sewing machine, health lamp and the usual kitchen and dining room appliances and only a normal lighting installation. Any home owner could buy and use much additional apparatus and service without difficulty.

But let us use this home as a unit yardstick and scale down the unit investment in wiring and appliances to a total of $1,000 per home for the same energy use and let us reduce the rate to 2 cents. Suppose all the homes had this equipment and use? The figures would appear as shown in the table at the bottom of the page.

These are startling totals. They may never be realized, but surely a large proportion of this market can and will be sold. The present investment in appliances and wiring in homes is estimated to be $5,100,000,000 and the total energy use is 12,800,000,000 kw.-hr. Thus the potential market based upon the unit home, after making these deductions, is an increased sale of $16,900,000,000 in appliances and wiring and an added energy use of 207,200,000,000 kw.-hr.

Assume that only 10 per cent of this business was obtained in a two-year period and the figures for results would be:

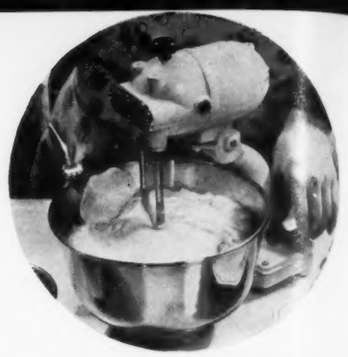
Sales of appliances and wiring	$1,690,000,000
Additional energy use, kw.-hr.	20,720,000,000
Additional revenue from energy sold	$415,000,000

Back of these consumer sales figures lie enormous sums for expenditures required in the electrical industry and in the general industrial field back of that. This, of course, would be necessary in order to supply the materials and services necessary to make the products put in the homes.

POSSIBILITIES IN HOME SALES

A SINGLE HOME	TOTAL FOR 22,000,000 HOMES
Investment in appliances and wiring . . $1,000	**$22,000,000,000**
Annual energy use . . . . . kw.-hr. 10,000	**220,000,000,000**
Annual bill for energy $200	**$4,400,000,000**

20,750,000
are wanted
$2,690,000,000



18,000,000
are wanted
$88,000,000

20,000,000
are wanted
$550,000,000

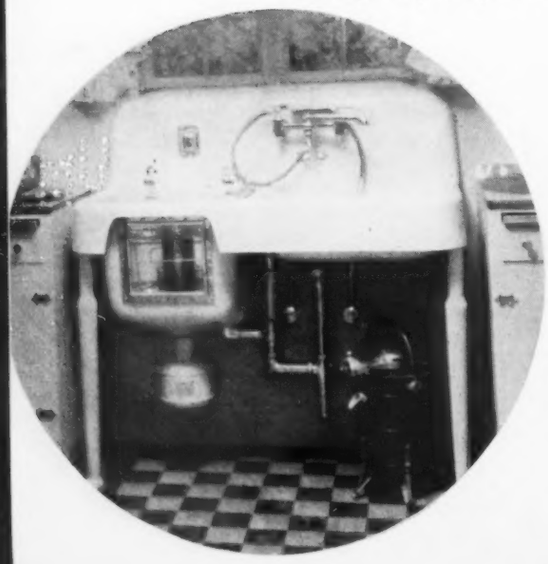
16,000,000
are wanted
$2,718,000,000

HOMES WITHOUT ELECTRIC CONVENIENCES

Top figure—Number without
Lower figure—Market value

21,100,000
are wanted
$1,095,000,000

21,900,000
are wanted
$2,200,000,000



22,000,000
are wanted
$13,000,000,000

21,700,000
are wanted
$3,250,000,000

12,500,000
are wanted
$817,000,000

Photos courtesy New York Edison Co.

THE IMMEDIATE OBJECTIVE

If the Utilities Are Not Destroyed

A 10 PER CENT ACCOMPLISHMENT IN TWO YEARS

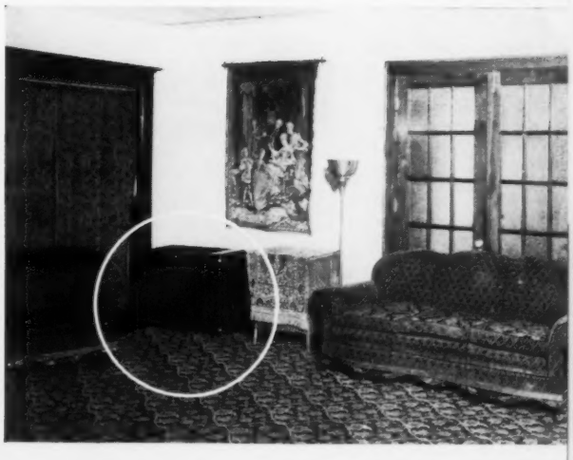
Appliances and wiring	$1,690,000,000
Additional energy use....kw.-hr.	20,755,000,000
Added revenue	$415,000,000

THE estimate of a 10 per cent expansion in home electrification within two years is conservative. That is, if the industry is free to make an organized effort to do the work and to spend the money necessary to get the business and service it. And despite its size, this business can be sold on the sound and economical basis of home owner satisfaction, convenience and economy.

HOMES NOT ONE-SIXTH ELECTRIFIED

on the average. Except for flat-irons and radios, not half the homes have these other appliances. Only one in ten have ranges or ironing machines. Dishwashers one in a thousand—air conditioning only a few hundred all told.

What can be done in the home workshop—the kitchen—on the left. Mere hints for the living quarters on this page. The figures on the illustrations show what the ultimate market is.



Electrified Farms Offer a $484,700,000 Business

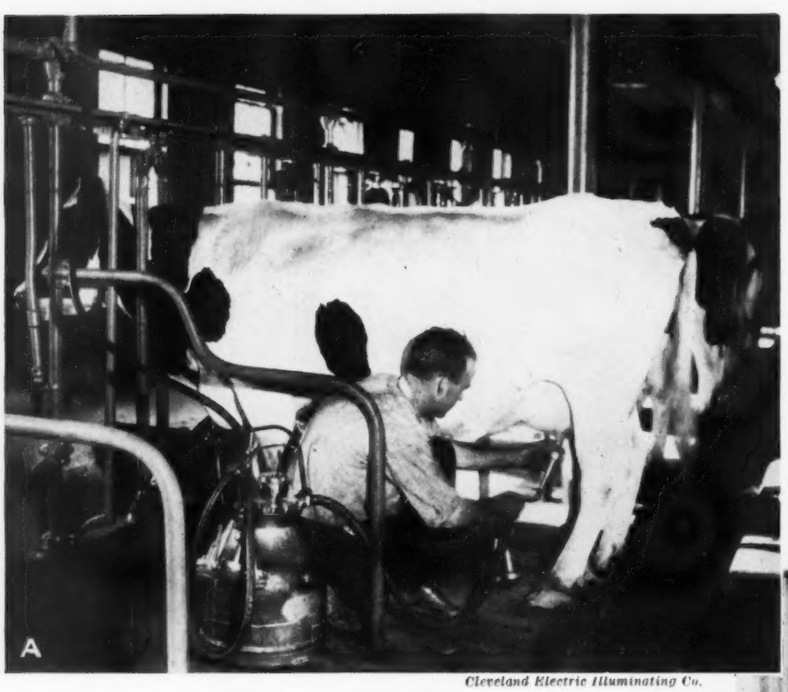
Each Farm Is a $2,145 Market

Apparatus and Wiring $484,700,000

OF 6,000,000 United States farms 740,000 are served with electricity. Let us assume that only 2,260,000 of these unserved farms are potential customers because of their economic characteristics or geographical location.

On these farms electricity should provide products and services in the farm home, for general use in barns, and in many other ways. The average farm home may be assumed to offer the same market as the average urban home, i. e., $1,000 for appliances and wiring, 10,000 kw.-hr. a year use and $200 revenue a year per customer for energy.

For farm purposes there is a wide variation in farm equipment and use. New developments are rapid. Electrified farms in Michigan, as given in



Cleveland Electric Illuminating Co.

(A) MILKING the cows morning and night is no longer the drudgery it once was for the farmer and his family. With electric milking machines only one-quarter to one-half the time of the manual operation is required. Up to twice as much milk has thus been obtained where lazy or unskillful hand milking was displaced.

REMOVAL OF MANURE and poultry droppings, and collection of eggs are being accomplished on some farms with motor-driven conveyors running through the stables or poultry houses to collecting points.

(B) SEPARATING MILK to permit the most profitable use thereof, churning, and bottling are just three of the dairy-farm operations now possible with electric power. It facilitates converting raw products into the maximum cash.

STERILIZATION of dairy equipment and cooling or refrigeration of milk immediately after extraction are becoming mandatory in most states. Steam or hot water for the first operation and facilities for cooling the milk are easily obtainable at any place with electric heat and power. Refrigeration also permits storage of meat throughout the summer.

Bliss Farm, Minnesota

Annual Revenue $58,760,000

740,000 of 6,000,000 Farms Now Served

C

National Lamp Works

D

Westinghouse

(C) NO MORE GROPING around the farmyard when attending to chores after dark or before daylight. That deadly enemy—fire—possible when a lantern is used in the stables and threatening a farmer's whole investment in buildings and stock, is largely banished with electric light inside and outside the farm buildings.

(D) ENSILAGE CUTTING and storage is easily accomplished with a cutter and blower driven by a portable general-purpose farm motor. The energy required should not exceed 1 kw.-hr. per ton ensiled in a 30-ft. silo. The portable motor can also be used for such purposes as storing sacked grain, sawing wood and mixing concrete. Note transformer is located at farm load center for best service.

data supplied by reliable electrical authorities, show a unit farm equipment market for electrical products of $1,145 and an annual energy use of 3,000 kw.-hr. This would give a total farm investment of about $2,145 for electrical products and wiring on each farm and an average energy use of 13,000 kw.-hr. a year. The average investment of present farms served may be assumed at about $800 and the average use of energy on the farms at only about 800-kw.-hr. a year.

We can thus place the farm market for seasonable use for house and farm as follows:

	Single Farm	2,260,000 Farms
Equipment, appliances and wiring	$ 2,145	$ 4,847,700,000
Energy use per year, kw.-hr.	13,000	29,380,000,000
Revenue per year	$ 260	$ 361,600,000

Here again the totals are large, but it is reasonable to say that a 10 per cent expansion in this market could be had in a two-year period by organized sales and work. This would give an immediate goal of:

Farm electrical equipment and wiring	$ 484,770,000
Energy used, kw.-hr.per year	2,938,000,000
Added revenue per year	$ 58,760,000

This is a relatively small expansion contrasted to that possible in the urban home market, but this electrification project is highly desirable from a national social and economic point of view. It can be accomplished.

Equipment	Cost to Farmer
Shop motor	$ 75
Utility portable motor	100
Milking machine	250
Cream separator	40
Milk cooler	150
Dairy water heater	25
Feed grinder	150
Barn lighting	25
Incubator	70
Brooder	25
Poultry water heater	20
Poultry house lights	20
Germinator	20
Yard lights	25
Water system	150
	$1,145
Average energy use per year (kilowatt-hours)	3,000

THE IMMEDIATE OBJECTIVE

If the Utilities Are Not Destroyed

A 10 PER CENT ACCOMPLISHMENT IN TWO YEARS

Electrical equipment and wiring . . $484,770,000

Energy used, kw.-hr. per year 2,938,000,000

Added revenue per year $36,160,000

Pacific Gas & Electric Co.

(E) RUNNING WATER in the home and for the livestock is a farmer's idea of heaven, made possible by electric pumping. Once a back-breaking task for wife or children, it is now available for drinking, cooking, washing, irrigation, or watering the livestock, by turning a faucet. Well-watered cows give more milk, particularly if the water is kept above 55 deg. F. during the winter. In Idaho this is done electrically with only ¼ kw.-hr. per day per cow.

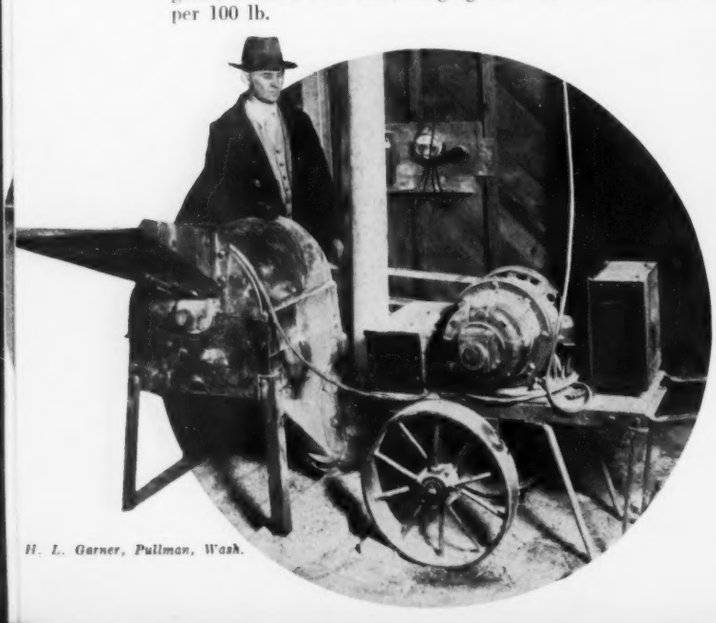
SPRAY IRRIGATION of truck farms and orchards and insecticide spraying of trees are facilitated by permanent piping installations fed by motor-driven pumps. Spray-irrigation systems cost $250 to $375 per acre, but may be profitable if they increase the selling value of crops by $50 or $60 per acre.

Northern States Power Company (Minneapolis)

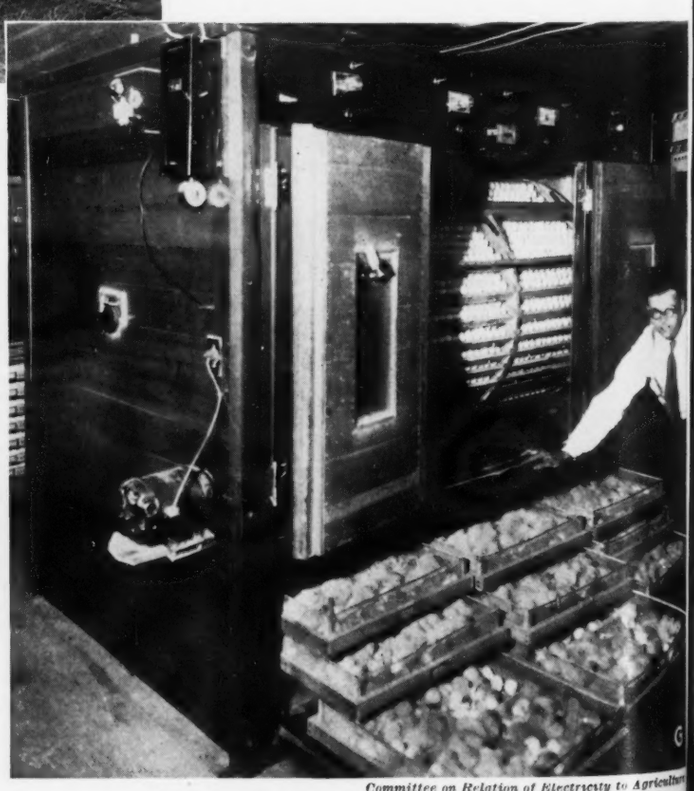
(F) THRESHING has become less of a task with purchased power, as it and the associated jobs can be performed either with individual drives that minimize belt problems or with easily portable motors available for other operations. Both avoid the potential fire hazard entailed with other motive power. The average energy consumption for grain threshing in Minnesota during 1926 ranged from 8/100 kw.-hr. per bushel for succotash to a little over ¼ kw.-hr. for wheat. The consumption for damp, tough grain full of weeds may be two or three times that for dry grain.

(G) INCUBATORS AND BROODERS using automatically controlled electric heat and ultra violet light are aiding poultry farmers to secure the maximum hatch, and healthiest chickens with the lowest death rate, so the maximum profit can be obtained from expenditures. Heat requirements range from 32 kw.-hr. per 1,000 eggs hatched (in 52,000-egg machines) to 197 kw.-hr. per 1,000 in incubators for 150 eggs or less. Brooders require from ½ kw.-hr. to 2 kw.-hr. per chick raised.

GRINDING AND MIXING FEED for the livestock need no longer be a tedious manual task if electric feed grinders and mixers are employed. Some farmers keep themselves supplied with ground feed without any attention except to push a button, by allowing the grain to feed by gravity into the grinder which discharges into a storage bin. Energy for grinding depends on the grain, fineness and mill, ranging from 1/10 to ½ kw.-hr. per 100 lb.



H. L. Garner, Pullman, Wash.



Committee on Relation of Electricity to Agriculture

SPROUTING OF PLANTS FOR EARLY SETTING—Growing of products for high-price winter markets and seed germination are being aided on numerous farms by the use of electric hot beds and germinators. Best results from seeding, better development of the plant and ability to secure the higher prices obtainable in early markets are some advantages.

J. W. Fleming, Buffalo, N. Y.

IRRIGATION by means of motor-driven pumps has increased the fertility of many otherwise profitless farms, has been a life saver during droughts and is many times essential to truck farming. The standpipe over the pump house (opposite page) is to maintain uniform head. For surface irrigation it requires from 2 to 4 kw.-hr. per acre-inch of water for every 10 ft. of lift, allowing for over-all efficiency.

CORN HUSKING has been the occasion for many enjoyable rural gatherings, but this operation and the more laborious shelling of corn can be greatly expedited by substituting motor-driven equipment operating on a continuous-feed basis for the batch system. Corn is husked on a Minnesota farm with less than ¼ kw.-hr. per bushel of husked corn, and shelling is accomplished on a Wisconsin farm at the rate of 1,000 to 1,500 lb. of shelled corn per hour with less than ¼ kw.-hr. per bushel.

Committee on Relation of Electricity to Agriculture

GRADING AND DEHYDRATION of fruit are expedited by motor-operated conveyors and electric heat. By using the latter citrus growers are able to spray their fruit with molten paraffin which prevents shrinkage and deterioration of the fruit.

STORING LOOSE OR SACKED GRAIN and hoisting hay, once back-breaking, labor-consuming tasks, can now be accomplished with portable general-purpose motors. The portable motor may be used for many other farm operations. One Minnesota grain elevator uses only 1 kw.-hr. per 100 bushels elevated, and a New Hampshire farm uses only ⅓ kw.-hr. per ton of hay hoisted.

Detroit Edison

Alabama Power Co.

TRAPPING AND KILLING OF DESTRUCTIVE INSECTS and earth worms have been successfully accomplished on many farms by various electrical methods. Electric-light traps attract and kill many insects.

Northern States Power

MOTOR AND POWER EQUIPMENT
$140,000,000

INDUSTRIAL HEAT EQUIPMENT
$59,600,000

ADDED ENERGY USE, KW.-HR.
4,755,000,000

ADDED REVENUE
$42,895,000

Sales to

ELECTRIC power is essential to American industry. Of the total horsepower used by industry at the 1929 industrial peak, aggregating 42,931,061, 82 per cent was electrical. Utilities served 22,775,664 electrical hp. and industry produced for itself 12,376,376 electrical hp. Power sold by the utilities under these conditions was 44,326,000,000 kw.-hr., at an average wholesale rate of 1.4 cents per kilowatt-hour.

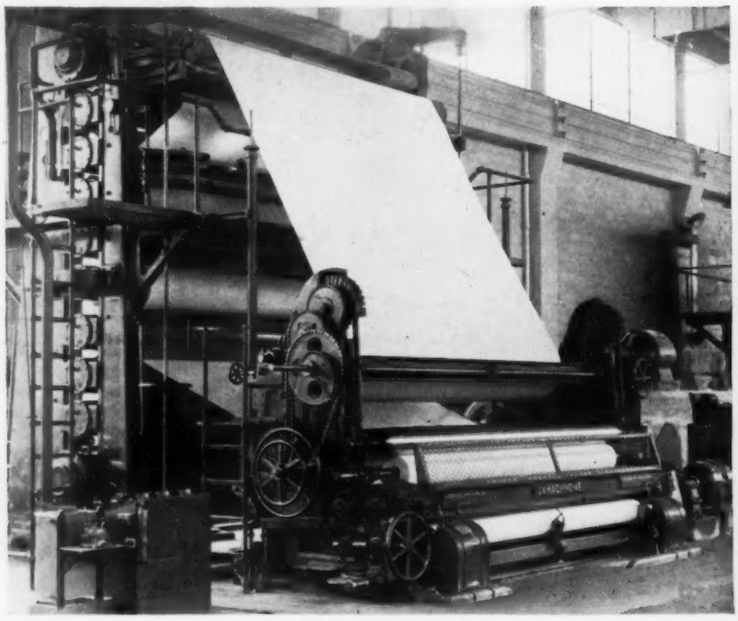
Thus, the immediate electrical power market in industry is found in the motorization of the remaining 18 per cent, replacement of obsolete equipment and adding to the rapidly expanding use of electric heat. Industrial modernization has come to mean industrial electrification.

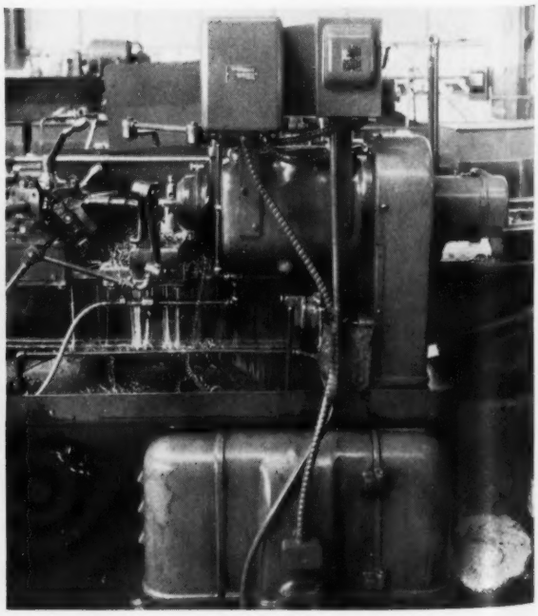
On the assumption of complete motorization of industry there is a market for 7,779,021 hp. in motors, which will use 11,800,000,000 kw.-hr. and produce the equivalent of an added revenue amounting to $147,000,000. In addition, there is a market for utilities in replacing the present 12,376,376 hp. of factory power with utility power. On top of this is the enormous replacement and modernization market. The steel industry, for example, is spending now about $70,000,000 for modernization through electrification.

Careful estimates to account for all these elements give a total effect of a 10 per cent industrial power expansion in a two-year period as follows:

Electrical equipment and wiring	$140,000,000
Added energy use, kw.-hr.	2,180,000,000
Added revenue	$19,620,000

These values may be considered small, but they take into consideration the present low stage of industrial production in capital goods. It should be noted that this electrical equipment expenditure would be multiplied several times if the industrial equipment





Industry of $199,600,000—*If* Utilities Are Not Destroyed

associated with the contemplated motorization is considered. These are minimum market data.

During the past few years motor additions to industry were at about a 1 per cent rate as measured by the total existing electrical horsepower used. Replacements were also very low, only sufficient to replace motors more than twenty years old. Deferred replacements of electrical equipment in industry running into hundreds of millions of dollars are only awaiting a rising industrial demand and this now appears to be coming. Industry is now remodeling its plants to meet the expected increase in business.

In addition to power markets in industry there has been a great development in electric heat and welding applications. Conservative estimates give a total heating load possibility at least equal in magnitude to the present power or motor load. An analysis of all markets and applications for heat gives an estimated heating installation of 14,900,000 kw. and energy use of 25,750,000,000 kw.-hr. in addition to the present estimated installation of 2,200,000 kw. and energy use of 5,200,000,000 kw.-hr.

On the basis of a 10 per cent expansion in two years through aggressive marketing the industrial heating market is:

Electrical equipment and wiring	$59,600,000
Energy use, kw.-hr.	2,575,000,000
Revenue from energy	$23,175,000

Thus, for the total industrial market, based upon the 10 per cent expansion in two years, the figures are:

Electrical equipment and wiring sales	$199,600,000
Added energy use, kw.-hr.	4,755,000,000
Added revenue	$42,895,000

As supplementary expenditures by industry itself to buy and install the equipment for use with motors and heating devices a sum of at least $1,000,000,000 would be required.

THE IMMEDIATE OBJECTIVE

If the Utilities Are Not Destroyed

A 10 PER CENT ACCOMPLISHMENT IN TWO YEARS

Equipment and wiring	**$199,600,000**
Added energy use kw.-hr.	**4,755,000,000**
Added revenue	**$42,895,000**

Transportation Market of $1,260,000,000

If the Utilities Are Not Destroyed

Only 5,200 Miles of Railroads Now Electrified Added Energy Use of 6,500,000,000 Kw.-Hr.

THERE are about 220,000 miles of railroads and 31,500 miles of street railways in this country. Only 5,200 miles of railroad are now electrified, but traffic conditions already warrant electrification in many localities, and this business will grow. Diesel-electric locomotive units have had wide acceptance for switching and yard service and for high-speed passenger traffic. The trolley bus is coming to the front rapidly. Subway extensions are being made. The transportation market is an electrical market that offers great possibility for stimulating capital-goods industries. An example of recent electrification of railroads is found in the $68,000,000 expenditure of the Pennsylvania Railroad.

A study of these possibilities in the immediate future based upon a 10 per cent expansion in two years gives the following data:

Electrical equipment and wiring	$1,260,000,000
Added energy use, kilowatt-hours	6,500,000,000
Added revenue from energy	$ 49,500,000

At present transportation uses about 7,000,000,000 kw.-hr. a year and has an investment of about $6,000,000,000. An expansion in the mileage of electrified railroads would involve very large supplemental expenditures on bridges, terminals and right-of-way that would involve thousands of man-hours of labor as well as the production of heavy equipment in the capital-goods industries.

"Main Street"— A Business of $45,000,000

IN 1934 there were 3,730,000 small light and power customers who used 13,150,000,000 kw.-hr. of energy, for which they paid $512,000,000. This type of business consists of stores, restaurants, small manufacturing establishments and others found in the multitude of small commercial establishments.

An expansion in these markets includes commercial electric cooking, air conditioning, refrigeration, ventilation, material handling, electric heating devices, lighting, signs and more use of electrical power equipment for production, convenience and material handling. Data on marketing possibilities in this field necessitate a study of each type of business and its electrification possibilities. For example, the 170,000 hotels, bakeries, restaurants and like establishments use about 400,000,000 kw.-hr. of energy for electric cooking today with an installed capacity of about 180,000 kw. Careful estimates show that there is additional business in this market for 2,000,000 kw. of capacity and 3,500,000,000 kw.-hr. of energy.

A summary of this market study gives the figures shown in the table above as present and available business among the commercial customers.

Small Light and Power Business

	Present	Additional Available	Total
Energy, kw.-hr.	13,150,000,000	15,850,000,000	29,000,000,000
Revenue	$512,000,000	$418,000,000	$930,000,000
Equipment and wiring	$370,000,000	$450,000,000	$820,000,000
Number of customers	3,730,000	370,000	4,100,000

THE IMMEDIATE OBJECTIVE

If the Utilities Are Not Destroyed

A 10 PER CENT ACCOMPLISHMENT IN TWO YEARS

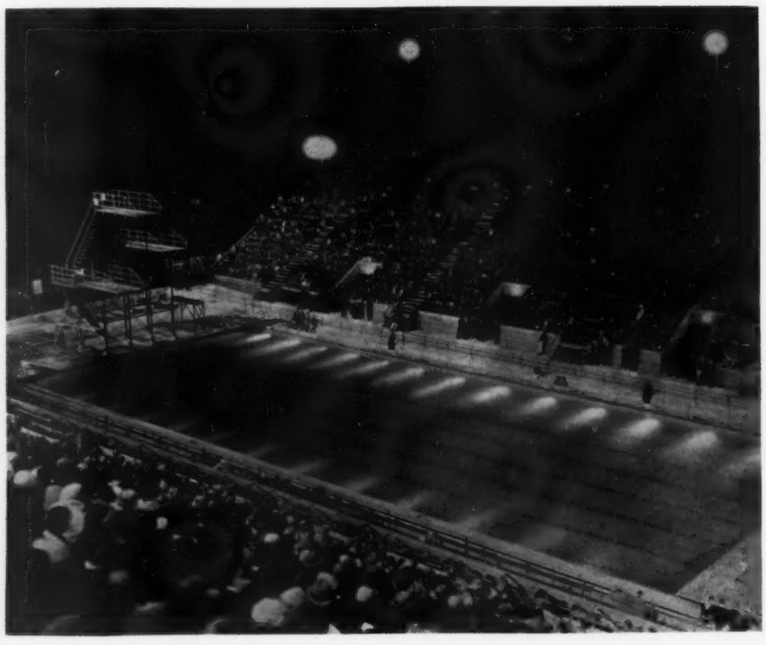
Equipment and wiring $15,000,000

Additional energy sold . . . . kw.-hr. 1,585,000,000

Additional revenue $41,800,000

Lighting Market Offers a $124,000,000 Business

Added Energy Sales of 960,000,000 Kw.-Hr. Are Possible if the Utilities Are Given Fair Treatment

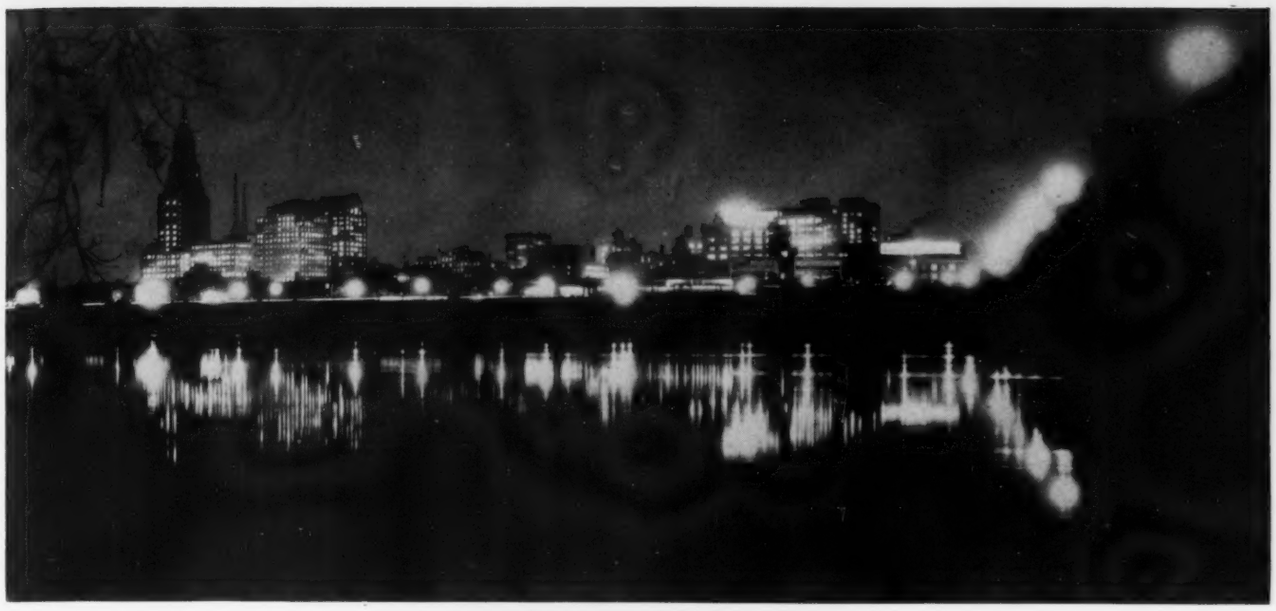


ELECTRIC LIGHTING is now universal, but its use is only in its infancy as yet. The development of the science of seeing has revolutionized conceptions of adequate lighting where people work, and one of the greatest social contributions made by the industry is the saving of eyes and physical energy. But when one considers the use of color lighting, of sign lighting, of lighting of exteriors and of streets and highways, an appreciation of the magnitude of the lighting market is had. New type and kinds of lights are available and electric light is indispensable in selling, in reducing accidents and crime and for contributing esthetic values.

It is impossible to measure the lighting market, in its present state of flux. The recent lighting for athletic events, the advent of the sodium lamp for highway lighting, the combination mercury-mazda lamp, the gaseous tube light—all these make it difficult to measure marketing possibilities. However, a general study of the lighting market, aside from streets and highways, gives the following total estimated figures based upon a 10 per cent expansion in two years:

Equipment and wiring	$ 60,000,000
Added energy use, kw.-hr.	500,000,000
Added revenue	$ 15,000,000

In addition it is worth while to study the possibilities for market expansion in street and highway lighting. Present municipal street lighting is inadequate and only a start has been made on highway lighting. This mar-



ket expansion is warranted upon the basis of accident prevention alone, and data are available to show that the cost would be more than made up by the savings from accident prevention.

Several states, notably New Jersey, are actively developing highway lighting. Recently the automobile industry, safety organizations and insurance companies have promoted better highway lighting. Undoubtedly highway lighting will be used for all improved roads in the near future.

There are about 358,000 miles of state highways in this country and the average cost of lighting these would be about $1,200 per mile, with an energy use of 7,300 kw.-hr. per mile per year. Present inadequate municipal street lighting uses about 2,200,000,000 kw.-hr. per year. On the basis of average cost and use the summary of municipal and highway lighting is as follows:

	Business	
	Present	Additional Available
Energy, kw.-hr.	2,400,000,000	4,600,000,000
Equipment and wiring	700,000,000	640,000,000

On the basis of a 10 per cent expansion in two years there would be sold $64,000,000 of equipment and wiring and 460,000,000 kw.-hr. The revenue for the energy would be about $9,000,000 per year.

Combining these two markets we get a conservative estimate of business possibilities in two years.

Equipment and wiring	$124,000,000
Added energy use, kw.-hr.	960,000,000
Added revenue	$ 24,000,000

This lighting market should receive great attention because good lighting has so many direct and indirect economic and social benefits. Plenty of light is available, it is inexpensive and it can be used freely and abundantly.

THE IMMEDIATE OBJECTIVE

If the Utilities Are Not Destroyed

A 10 PER CENT ACCOMPLISHMENT IN TWO YEAR

Equipment and wiring sales $124,000,00

Added energy use . . . . . kw.-hr. 960,000,00

Added revenue $24,000,00

Summary of Effect Upon Manufacturing and Distribution

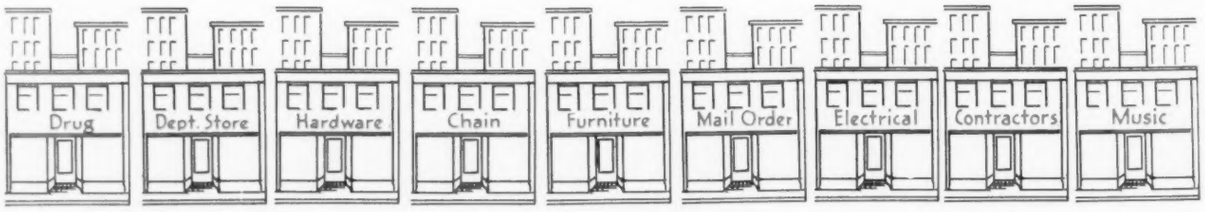
A Market

If the Utilities Are Not Destroyed

Will Add 414,000 Employees
Additional Wages of
$590,000,000 a Year

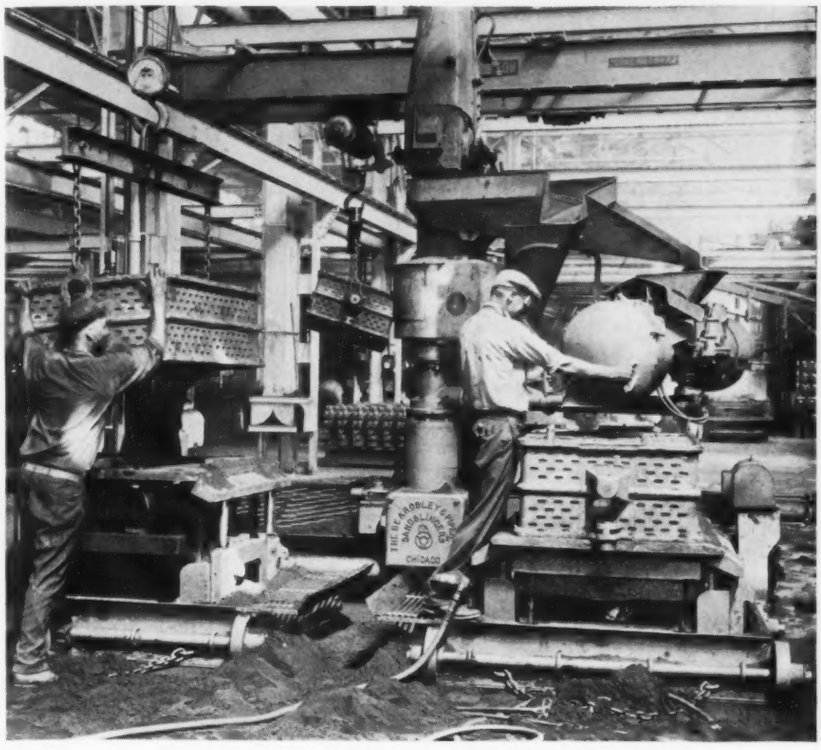
MANUFACTURERS OF ELECTRICAL PRODUCTS WOULD PUT 227,000 MEN TO WORK

WHOLESALERS IN MANY INDUSTRIES SELL ELECTRICAL PRODUCTS AND WOULD GET $775,000,000 A YEAR



THOUSANDS OF RETAIL AND CONTRACTING ESTABLISHMENTS WOULD GAIN $1,149,000,000 IN BUSINESS PER YEAR AND PUT 165,000 MEN TO WORK

of $6,428,000,000 Is Possible



AT THE 1929 peak year the total value of all manufactured electrical products at factory prices was $2,234,246,358. This is the order of magnitude necessitated in electrical manufacturing to carry out the two-year recovery program. An analysis of these products and their values related to utility generating capacity expansion gives a unit value of product of $290 per kilowatt of added generating capacity.

Utilities would be required to add 8,900,000 kw. of generating capacity to carry out the expansion program contemplated so that the total value of products manufactured would be $2,580,000,000 in the two-year program. Based upon census data and ratios, the summary effect of this expansion in electrical manufacturing would be as follows:

Effect of Recovery Program on Electrical Manufacturing

	Two Years	Per Year
Value of products	$2,580,000,000	$1,290,000,000
Wages	700,000,000	350,000,000
Added employees	227,000	227,000

An expansion in manufacturing facilities would be required in the production of some appliances and undoubtedly an additional sales personnel would be required to sell the products. It is also interesting to note that there would be an increased bill for fuel and energy of $12,400,000 per year and additional copper purchases would be at the rate of about $20,000,000 a year. When it is known that from 20,000 to 50,000 kinds of items are on the purchasing lists of large electrical manufacturers some idea may be gained of the effect of this business upon dollar volume and employment in other industries.

Many of these electrical products are sold through the 3,870 electrical wholesale establishments. On the assumption of 60 per cent, the added wholesale business per year is $775,000,000 at wholesale prices. Using the census ratios for labor and wages, the total effect of the program on wholesaling is as follows:

Effect of Recovery Program on Electrical Wholesaling

	Two Years	Per Year
Value of sales	$1,550,000,000	$775,000,000
Additional wages	88,500,000	44,250,000
Additional employees	22,000	22,000

This business for the wholesalers would require more than normal ratios of salesmen to sales value so that the 22,000 added employees represent a minimum effect.

But the retailer and contractor must also be considered, for these will sell and install most of the wiring, appliances and lighting for homes and farms as well as in a part of the industrial markets. Our estimate of the value of this business and its effect upon employment and wages in these units of the industry is as follows:

Effect Upon Retailers and Contractors

	Two Years	One Year
Value of sales	$2,298,000,000	$1,149,000,000
Additional wages	392,000,000	196,000,000
Employees added	165,000	165,000

Additional workmen and salesmen would probably be necessary and no consideration is given to the large number of men that would be required in advertising, promotion, demonstration and maintenance.

For the entire manufacturing, wholesaling, retailing and contracting branches of the industry the total resultant business volume, payroll and employment are given in the accompanying table. The effect upon employment is particularly noticeable.

EFFECT UPON MANUFACTURING, WHOLESALING, RETAILING AND CONTRACTIN(

	Two Years	One Year
Added sales	$6,428,000,000	$3,214,000,00
Additional wages	$1,180,000,000	$590,000,00
Additional employees	414,000	414,00

Effect of Marketing Program Upon Utilities

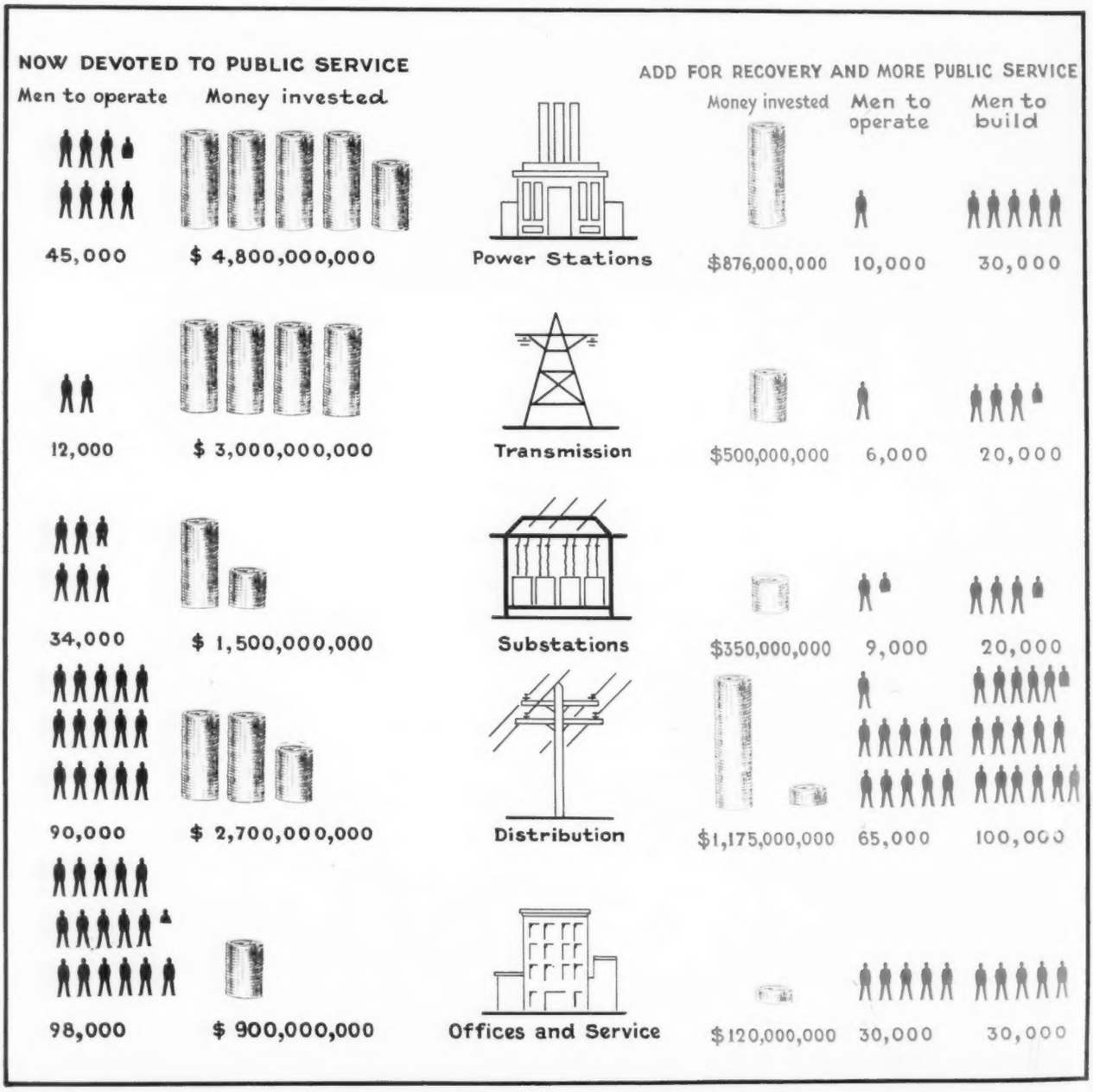
If the Utilities Are Not Destroyed

Put 320.000 Men to Work

Pay $120.000.000 More Taxes

Add $182.000.000 to Payrolls

Aid Durable Goods Industries



Power Companies Would Spend $3,021,800,000

UTILITIES must aid in selling and must supply the facilities and energy necessary to the recovery program. They must help sell the $3,763,370,000 of equipment and wiring in the several markets; they must provide for 37,493,000,000 kw.-hr. of additional energy and will receive in revenue based upon rates that will get the business about $631,955,000 during this two-year program.

To estimate what this program means to utility investment, employment and operating costs requires a detailed analysis of present equipment, employment, losses and loads. There is surplus capacity available in some areas. Expansion is not necessary in generating, transmitting and distributing facilities in the same magnitude. But the general results of such a study lead to an over-all expansion of the utility industry capital investment of about 20 per cent.

The estimated added capital expenditures are as follows:

Generating stations	$ 876,800,000
Transmission lines	500,000,000
Substations	350,000,000
Distribution	1,175,000,000
Offices and miscellaneous	120,000,000
	$3,021,800,000

Based upon the latest census percentages the revenue from the increased business would be allocated as follows on an annual basis:

Charges on investment, 6%	$181,200,000
Added cost of fuel	65,000,000
Added wages	150,000,000
Added tax payments	120,000,000
Added maintenance	40,000,000
Added retirement funds	40,000,000
Added bills and miscellaneous	30,000,000
	$526,200,000

Considering the present employment conditions and the usual ratios of labor to investment and revenue values it is estimated that utilities would add 120,000 men to their staffs for operation and maintenance with an annual wage bill of $150,000,000. In addition, it should be noted that the construction of facilities charged to capital account and amounting to $3,021,800,000 would require the expenditure of at least $600,000,000 for construction labor in the two-year period, which is equivalent to the employment of 200,000 men. Thus the total employment effect of the utility expansion program is to give permanent employment to 120,000 men and two years of employment to an added 200,000 men.

Of course, for the 14,000,000 additional tons of fuel required to produce the energy and for the great amount of equipment used in construction direct and indirect labor is required clear back to coal mines, iron mines, forests and rubber plantations.

This rate of expansion in the utility business is practicable and is but little larger than has occurred in past periods. Added costs can be met from expected revenues and utility expenditures would create a large movement in the capital goods industries. The problems associated with money, credit and service necessary to carry out this expansion program will be dealt with elsewhere.

UTILITY CAPITAL EXPENDITURES TO CARRY THE LOADS

Generating stations	**$876,800,000**
Transmission lines	**500,000,000**
Substations	**330,000,000**
Distribution	**1,175,000,000**
Offices and miscellaneous	**120,000,000**
	$3,021,800,000

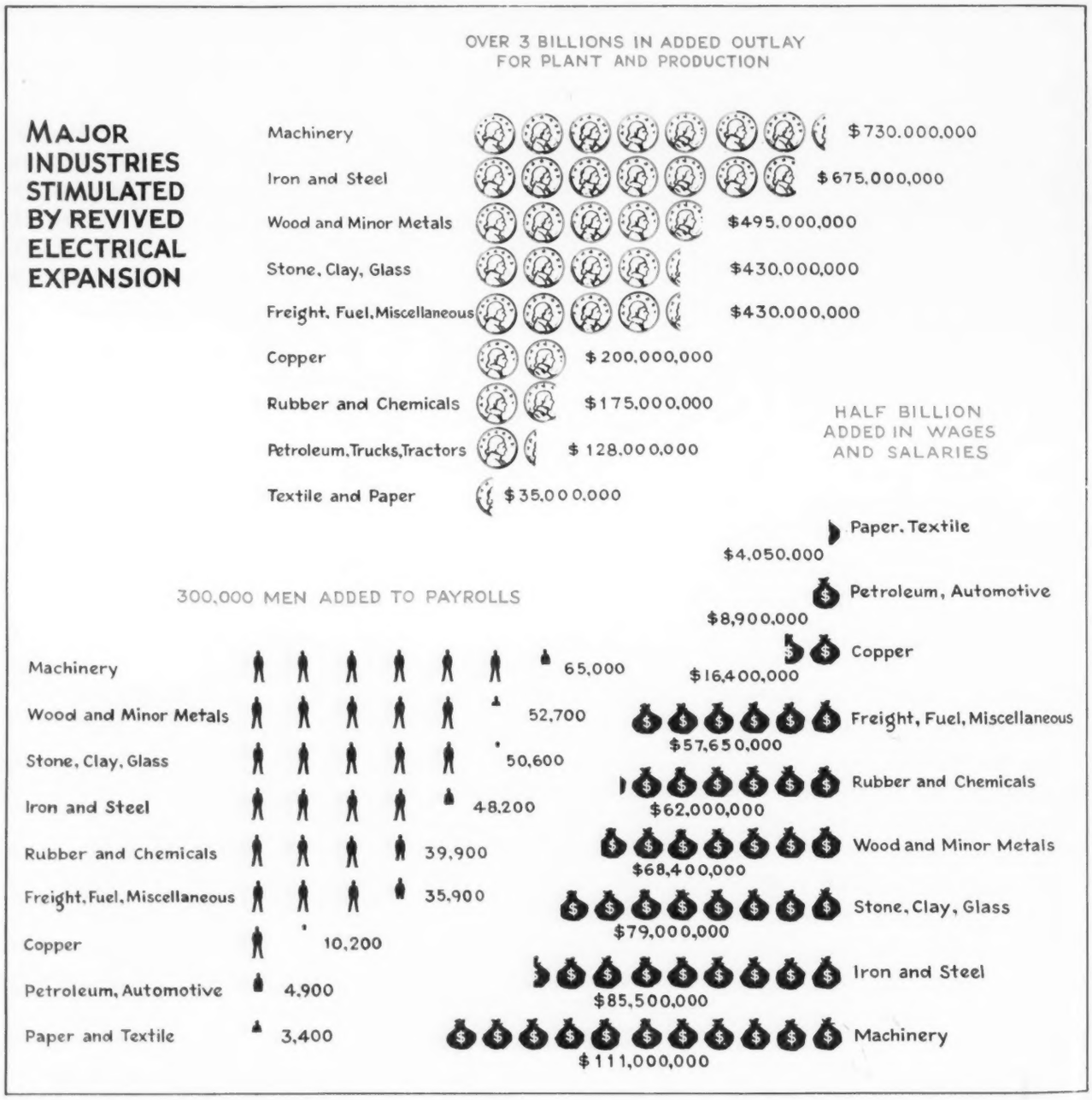
Electrical Marketing Effect on Other Industries

If the Utilities Are Not Destroyed

311,300 added employees

Increased payrolls of $493,400,000

All major industries affected


MAJOR INDUSTRIES STIMULATED BY REVIVED ELECTRICAL EXPANSION
OVER 3 BILLIONS IN ADDED OUTLAY FOR PLANT AND PRODUCTION
Machinery $730,000,000
Iron and Steel $675,000,000
Wood and Minor Metals $495,000,000
Stone, Clay, Glass $430,000,000
Freight, Fuel, Miscellaneous $430,000,000
Copper $200,000,000
Rubber and Chemicals $175,000,000
Petroleum, Trucks, Tractors $128,000,000
Textile and Paper $35,000,000
300,000 MEN ADDED TO PAYROLLS
Machinery 65,000
Wood and Minor Metals 52,700
Stone, Clay, Glass 50,600
Iron and Steel 48,200
Rubber and Chemicals 39,900
Freight, Fuel, Miscellaneous 35,900
Copper 10,200
Petroleum, Automotive 4,900
Paper and Textile 3,400
HALF BILLION ADDED IN WAGES AND SALARIES
Paper, Textile $4,050,000
Petroleum, Automotive $8,900,000
Copper $16,400,000
Freight, Fuel, Miscellaneous $57,650,000
Rubber and Chemicals $62,000,000
Wood and Minor Metals $68,400,000
Stone, Clay, Glass $79,000,000
Iron and Steel $85,500,000
Machinery $111,000,000

$3,300,000,000 Stimulus to Durable Goods

greater than the value of the electrical products purchased. Only a small per cent of the money spent for utility construction and physical facilities goes to the electrical industry. Electrical manufacturers must buy supplies and materials from a purchasing group that represents makers of some 50,000 different items. Goods sold in the markets reflect themselves in a great stimulus to all durable goods industries.

The estimates given in the accompanying table do not include the data already given in electrical manufacturing and electric power supply. They represent added business, added employment and added wages paid in other industries.

WHAT effect would the recovery program proposed have upon the durable goods industries? These have been hardest hit by the depression and their recovery is necessary to renewed prosperity and more employment.

Careful estimates show that these industries would spend $3,300,000,000 over two years in order to supply materials and products to carry out the electrification program. They would put 310,000 men to work who would draw an annual payroll of $493,400,000. This is the effect of the activities in the markets, by utilities, electrical manufacturers and distributors.

Ranges, water heaters, irons and other devices sold to homes reach back to the steel mills, the rubber plantation, the iron mine, the chemical plant and a hundred other primary industries for their raw materials and parts. An electrified steel mill means added steel-making and material-handling equipment, work for machine shops and machine tools and a multiplied turnover in buying and spending far

EFFECT UPON MAJOR AMERICAN INDUSTRIES

Industry	Total Expenditures Over Two Years	Added Employees Per Year	Added Salaries and Wages Per Year
Iron and steel...	$675,000,000	48,200	$85,500,000
Machinery	730,000,000	65,500	111,000,000
Copper	200,000,000	10,200	16,400,000
Other metals	180,000,000	9,000	14,400,000
Stone, clay, glass.	430,000,000	50,600	79,000,000
Wood	315,000,000	43,700	54,000,000
Rubber	45,000,000	34,500	54,500,000
Chemicals	130,000,000	5,400	8,000,000
Petroleum	78,000,000	1,800	3,300,000
Paper	10,000,000	800	1,050,000
Trucks & tractors	50,000,000	3,100	5,600,000
Textile	25,000,000	2,600	3,000,000
Fuel	10,000,000	600	650,000
Freight	55,000,000	8,800	17,000,000
Miscellaneous ...	367,000,000	26,500	40,000,000
Total	$3,300,000,000	311,300	$493,400,000

These Markets Can Be Sold

Promotion Cost of $110,000,000
Direct Advertising Cost of $120,000,000
Direct Sales Costs of $300,000,000

THE PEOPLE of the United States are today spending at the rate of $1,000,000,000 a year for new electrical equipment. A few years ago they were spending at the rate of $2,500,000,000 a year. There will come a day, once again, when these consumers will spend $3,763,370,000 in a two-year period, as suggested in this recovery program, or at the rate of $1,881,685,000 a year. When will that be?

That day will come when the executives of this industry are again free to devote their energies to the job of expanding service in these markets.

There is always a price to pay for accelerated selling, and it is necessary to find out whether the proposed marketing program will support this price or is just a visionary idea. Costs and returns of the program when it is put into operation as a practical business endeavor must be found. Can the business be had? How much money will it take to get it? Where will the money come from? What credits are needed? What organization is required? What will be the cost? What will be the profits? These questions must be answered before it can be said that the recovery program is good business.

To start with, we find that the modern magic has been developed into a very large business. There is a large, competent and well-organized mechanism to turn the wheels in production, distribution and sales. Leaders of the several branches have vision, experience and capacity, as proved by their record of accomplishment in the relatively short time in which the industry has existed. Electric power, machines for using it and facilities for distributing it can be produced in almost unlimited abundance at a steadily decreased cost if the volume can be increased.

Facilities readily expanded

Another question to be answered involves the availability of existing facilities to make the products and supply the services. Are they sufficiently large or must they be expanded, thus requiring both construction and time? In the utility field, the major facilities for power production and distribution exist. There are more power stations than county seats, nearly as many transmission miles as railroad miles. A veritable network of electric power facilities is spread over the country. This needs to be expanded only slightly, but a major operation must be performed to increase the service capacity of the existing installation because of the increased use contemplated in the sales program. This can be had rapidly for all facilities except large generating and transforming apparatus. Here, however, the present surplus affords the necessary time element required to manufacture these items. Also, the consumers would be forced to rewire and remodel their existing installations, but this may be done quickly, or at least at a rate required to keep level with the growth of sales.

In the manufacturing and distributing branches of the industry ample facilities exist for a major expansion in production and sales. Only with respect to some of the domestic appliances would additional manufacturing capacity be needed, and this may be had within the time limits available. In wholesaling, retailing and contracting there are sufficient number of establishments to do the business contemplated, but large additions to the sales forces would be necessary. This requires time, money and effort, for a good salesman must be trained and must possess the requisite personal and mental traits.

Sales staffs eager for task

A study of the physical plant and measurement of the leadership and the man-power requirements shows that the industry can carry out the sales program. Since it is but slightly larger than the volume already recorded in past years, the present organizations and forces could be expanded readily.

But what about the cost of the job? How fast can this marketing be pushed and still retain underneath it a sound economic foundation? These questions reduce the problem to a dollars and cents answer. Business growth by sales effort has three fundamental requirements. These are:

$530,000,000 FOR PROMOTION AND SALES COSTS OVER A TWO-YEAR PERIOD TO SELL $3,763,370,000

	Per Year	Two Years
Creation of Buyer Interest:		
1. National promotion. Radio, advertising, etc., joint effort.	$5,000,000	$10,000,000
2. National promotion. Individual products and services.	$50,000,000	$100,000,000
Direct national and local product advertising by industry units	$60,000,000	$120,000,000
Direct costs of sales and distribution	$150,000,000	$300,000,000
Total for all branches	$265,000,000	$530,000,000
Overhead distribution and sales costs	$100,000,000	$200,000,000

by a United Industry

Sales Facilities and Man-Power Available If Legislation Does Not Handicap the Utilities

1. Creation of consumer demand.
2. Direct application of all possible sales agencies and sales methods.
3. Products and services in sufficient volume and at prices that will satisfy consumer demands.

We may say that a large consumer demand has already been created. The acts and the talks of the Administration at Washington have done much to make home as well as farm owners electricity conscious. Also, and in perhaps greater measure, the combined efforts of the branches of the industry itself have built up over a period of years a tremendous unsatisfied demand for electrification. Much, therefore, has been done. But much more, very much more, must be done and done at once. These admirable efforts must be increased and they must be more specific in character. The grand line of tools for this large scale promotion are: Radio; advertising; demonstrations; publicity addressed to the housewife, farmer, factory owner, down to the very passer-by of the streets. This promotion must be general and also it must be aligned with specific products and services.

The creation of public desire for products and services is expensive. It took $25,000,000 to promote the idea of electric refrigeration as one example. A fair estimate of the sum needed for sales promotion as a co-operative effort of the industry over a two-year period is $10,000,000, or at the rate of $5,000,000 a year. In addition, individual units and branches of the industry would be required to spend $100,000,000 on promotion, or at the rate of $50,000,000 a year. This type of promotion is imperative in all business progress. It supplements product advertising. It is behind sales. It creates the volume of business done. It is, of all outlays, that most necessary to create the desire to buy in the minds of prospective purchasers.

But direct advertising of products is also necessary. This cost, according to usual practice in selling $3,763,370,000 of products, would be at least $120,000,000 for the two years, or at the rate of $60,000,000 a year. Direct advertising makes consumers buy a specific product or service. It creates volume in individual items. It supports sales. Direct sales expenses are large in any business, and at least $300,000,000 would be required to pay the two-year bill in the contemplated sales program, or at the rate of $150,000,000 a year. Warehousing, billing, handling, rents, wages and other costs in handling the large volume of business contemplated are necessary expenditures. It takes a large number of stores and a multitude of salespeople to sell the individual consumers.

Promotion a large factor

Promotion, advertising and sales expenses increase with the rate at which it is desired to get business. This is a law of increasing expenditure that pertains to rapid selling. In every one of the electrical markets the full pressure of promotion, demonstration, advertising and selling must be exerted continuously. As pointed out, the direct cost of these items over a two-year period for the volume of business expected would be $530,000,000, or about 14 per cent of the retail sales value of the products sold. It should also be noted that capital would be tied up each year in term financing of many of the purchases. This is a part of normal business operations in present consumer markets and must be considered. In addition, a large sum in distribution overhead must be expended.

The final conclusion of any study of practical possibility in carrying out the contemplated program is that it is practicable and can be done provided that money for utility construction, for manufacturers, for promoting, advertising, financing and selling can be had. An enormous sum is required. Some of it is represented by tangible equity purchases, such as power houses and new factories, and these might be had from investment funds through security sales. But a large part of it is based upon commercial expectations of increased sales.

It is quite feasible to form an industry agency which will get and supply the money needed for both joint and individual promotional advertising and sales expenditure. The scheme is sound, the security is the best, there are few sound opportunities for lending or investing today that can compete with it in any way or extent. We have full confidence that the financial problem can be solved and will be solved, and quickly, when the industry receives the friendly support of the government and the public.

In cold business terms, this marketing program can be carried out. It can be done economically and profitably. There is only one ticklish—not grave, but difficult—element. It is credit and finance. It can be overcome. The electrical industry has the man-power, the facilities and the organization to carry through this recovery program.

Edison Men in Perspective

From the Vanderbilt Home to the American Grid
Three Business Eras in Only Fifty Years
Lessons of Experience Ready for Application

FIFTY-THREE years ago this winter, in 1882, the reigning Mrs. Vanderbilt gave a new kind of party. It was scientific and historic. It was the first electric light party. It was a dinner, followed by a ball. Everybody stayed late and everybody liked Mr. Edison's new gadget. Then, unfortunately, Mrs. Vanderbilt went outside and heard a noise. "What is that noise?" she inquired. "The exhaust of the engine that drives the electric dynamo for the lights, Madam," was the reply. "Then there's a boiler in my house, is there? Take that thing of Mr. Edison's out tomorrow. I'll have no boiler in my house." Social Register installation Number One ended there. That was on Fifth Avenue.

Morgan carried overload

Over on Madison Avenue, at the corner of 37th Street, John Pierpont Morgan installed in his brownstone edifice 600 bulbs and established among the terrified thoroughbreds within the Georgian stable an engine-dynamo for 400 lamps. Late of nights he would bring club friends home, to show off the marvel. He would turn lights on and on, until they were burning to the number of 400. Then he would turn on some more. All got dimmer. Finally he got darkness. The magnificent Morgan roared for his chief engineer. That craftsman had told him repeatedly, and again reiterated, that the installation had a capacity of 400 lamps, not 600 lamps. "I forgot that. All right." The next week, if not indeed the next night, the episode occurred again.

Contrast this with electrical conditions in 19,500,000 homes today. There are no exhausts, no boilers, no engines, no chief engineers and there are no poor too poor to be lighted by electricity along their weary way. This is an accomplishment of the electric companies. Their light and power is safe, noiseless, cheap, and it does not run out on Morgans or on Cohens or on Joneses. Back of this large feat, however, lies a romance in research, a whole culture of precision in making things, a craft and guild in installing and operating electrical facilities, a new sagacity in the executive branch of a widespread industry.

The '80s were the Edison Decade. That hourless man of genius was in incubation. He was creating a lamp, an engine-dynamo, a system for conveying electricity through streets, inside houses, about factories, ways to measure in meters, means to get fixtures to hold his lamps. His workable devices are now in the class with the Dodo. Man's ingenuity has flowered. There has been a race of Edison men. The result is that the magic of electric current now is casual, a necessity, an everyday affair whose absence is unthinkable. Let the service be suspended even for a moment and there would be revolution—chaos and first night. All this grew up because other men of genius built upon the basis of the first genius, Edison.

It is reported that Gladstone said to Michael Faraday: "Yes, your electricity is an interesting, even a remarkable, toy, but what use is it?" "Useful for taxation, some day," Faraday told him, not guessing the half of it. In half a century it has become a major national business, perhaps the major one. Users are by millions, investors are numbered by several millions, workers by hundred thousands, lines of transmission nearing the quarter million, power stations by thousands and products and applications are countless. It is in the nature of things that such a giant should not have been able to grow up without what is called a history. Its history, therefore, has the characteristics of the history of any great "historical," man-made thing.

Three major cycles were there. First, there was Pearl Street. It was the original central station. It served the densest, richest and most adventurous area—Wall Street. It was copied, widely and rapidly. At the same time there were being installed many small Edison units in homes, factories and stores. New electrical business enterprises were, in this epoch, springing up by the hundreds, by the thousands even. Some cities soon had three or four competing systems, each with its own central plant. This was not without competition, because gas companies fought back. Manufacturers of all sorts of electrical wares sprouted overnight, competing vigorously and even building or subsidizing local utility companies. Speculation, promotion and security juggling accompanied chaos in the field of manufacture of electricity and electrical operation. Between 1882 and 1898 direct-current electricity grew up. The situation gradually became more stable and better consolidated, until in 1898 most cities had unified central-station supply from single utility concerns. Manufacturing settled down to a sound business. It looked as if the Edison system were the end and aim of electrification.

Transmission enters the arena

Then came alternating current. It made possible long-distance transmission and a simpler and more rugged motor. Niagara, and other cataracts, could be harnessed for power. It got to be feasible to send electricity to small towns and villages. Regional power supply areas could be developed. A new system meant a new impetus and a new competition.

Alternating current fought direct current. Longer lines were built and

Since 1882 electrical men have marveled at American electrification

Starting with the Philadelphia Exposition, electrical men from all parts of the world come to America to see electrical developments. Members of the International Electrotechnical Commission at the St. Louis World's Fair.

water powers were put under control. Franchise rights for city and town brought fresh wars and hard-waged ones. The induction motor brought power to factories, revolutionized industrial processes and took over the operation of whole industries. From 1898 until the World War this other war went on. Only gradually did stability and consolidation come along.

If these enterprises must squabble, the citizen bystanders figured some kind of policeman ought to be able to keep order. So they set up regulatory commissions. Beginning in earnest about 1910, state after state established boards which told the companies to quiet down, give service, charge the right kind of rates and charge off some of the bruises of the squabble era. Gradually this supervision injected stability, elimination of useless competition and a sense of public service responsibility. That temper was dominant until everything began to go haywire again after the war was over.

The war itself came as the opening gun of the next great cycle in electrical development. Because of the major economies possible, because of stability in earnings, too, it became socially economical to own several utilities, or utilities serving large areas. The holding company expanded and grew as the best-discovered corporate and management agent. It developed this magnitude of business and it managed it. It grew fast, bought and sold properties, trying first to diversify and later to consolidate holdings. It built interconnecting transmission lines and standardized practice and policy. It competed fiercely for territories and properties. After the war it went crazy with speculation, as did all men and companies of men. Executives of all industry spent more time and thought on securities and on the stock market than they did on operations. Too many purely speculative types of holding companies appeared. Financial adventurers of large stature fought to get or to keep control. It was an era of speculative finance par excellence.

Some things stood and some things were real, however. Tangible electric power facilities had been built, consolidations had gone through, operating standards and economies had been improved. There were and there remain today, tremendous tangible contributions to the public interest and to values in power supply.

This Cycle Three ended in the market débâcle. Then came depression. Speculative values were deflated. Forms of organization were changed and some speculative holding companies disappeared. The true place and function of the holding company became determined. Federal regulation came over the horizon and state regulation was strengthened. The depression put the industry firmly on a platform of service, operation and performance. It made the industry clean house and attend to business. Leadership within the industry is again eager to go ahead, competent and confident that it can do the job that lies ahead. Facilities and men are here. They need only to be free to work.

There, briefly, are the past cycles in electricity. It is the business story of human failings and succeedings. Now that we strike a balance the achievements stand out, unparalleled. Purged as they have been by experience, electrical men are at the take-off point for Era Four—electricity for everything.

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The Staff That Directs the Battle

WE WONDER at the political astuteness of those opposed to the private ownership of utilities in this country. For years they were a small minority, without position or influence, who shouted from their soapboxes. Now they are intrenched in Washington. They sit behind the scenes and move their papers and puppets quite effectively and yet refrain from personal publicity or an out-and-out declaration for public ownership.

Just now the holding company bill is a case in point. Attention is focussed upon the destructive holding company provisions, but hidden in the bill are clauses that give practically complete federal control of operating companies and that pave the way for government ownership. For example, private companies must become "common carriers" of energy to and from federal and municipal plants that are wholly immune from the provisions of the bill. And, while this holding bill holds attention, three other bills go out to the states under P.W.A. auspices that further prepare the way for the ultimate goal so ardently desired by the government ownership advocates. These P.W.A. bills are gems of legal phrasing and deadly in their import.

We wonder that neither the government nor the public recognizes the real purpose of these "behind the scenes" enemies of private enterprise. Who drew these bills? Who wrote the reports of the several federal agencies dealing with power supply? Who staffs these bureaus and committees? The facts should be known about these men and their true purposes expressed to the public.

These men are the originators of the war on utilities and they wage it under camouflage. They know how to exaggerate the importance of the $600,000,000 spent by domestic consumers for electric service—a 2 per cent item in the average family budget. They show certain politicians that electricity is used by nearly all voters and that the utility business is too technical to be understood by the public, so that it offers a wide field for attack and propaganda. They show that the utilities are fairly prosperous and are "big business," and therefore open to attack by those who think wealth and size are synonomous with evil.

This heated political fight is over a matter which in dollars and cents means little to the citizens of this country. It is based upon distortion and exaggeration without parallel and it is brought in order to destroy the effectiveness of a private industry vital to national welfare. The war has its genesis in a few individuals, some sincere and some self-seeking, who wish to bring about one thing—the socialization of the utility business. They are masters of destructive exploitation and propaganda. It is time that the public learned who these people are, what they seek and how they are going about their work under the protection of a benevolent Administration that put them in position without, we hope, being aware of their capacity to injure private enterprise.

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Regulation as a Complete Control

AGITATION for more regulation of utilities exists. Much of this is based upon ulterior motives or a misunderstanding of the present regulatory powers. Nearly all state commissions now have complete control of operating utilities. They fix rates based upon the fair value of the property. They fix the accounting systems for utilities. They control security issues, expenditures and purchases and sales of properties. In large measure they infringe upon the function of management. If state regulation fails in some instances it is not because of any lack of power to regulate.

But it may be said that the holding company and interstate power business are unregulated. This has been true in some degree; it is not applicable today and it does not affect rates offered to consumers. A large part of the criticism is in regard to holding company financing, accounting and security sales. Why not elaborate and make definite the power of the new Securities Exchange Commission to regulate this aspect of the business. Permit S.E.C. to control security issues, fix accounting systems, pass upon balance sheet items such as loans and write-ups and keep in close touch with holding company activities. The top and subordinate holding companies could well be controlled by this commission on all financial matters over which state commissions have no jurisdiction.

Interstate power regulation is largely a local matter; at best it concerns only two or three states. It is a relatively small part of the business and we believe interstate boards formed from members of the state commissions concerned could best regulate this business. They know the local conditions and are intimately acquainted with local utilities. These boards could pass upon contracts and practices that deal with interstate power.

There is no need to duplicate state and federal regulation. There is no doubt that S.E.C. and the state commissions can do the regulating necessary to prevent abuses in finance or operations. Utility leaders agree with these suggestions as is shown by their recent testimony in Washington. Why not find out what more is needed or advisable in utility regulation and what now exists and then empower the regulatory bodies already established to carry out the program? This appears to be the sensible conclusion. But the agitation in Washington is not designed to improve regulation; it is part of a plan to destroy private utilities.

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R.F.C. Seizes Clarke Utility

THE R.F.C. has taken over control and management of the Public Utilities Securities Corporation—the top holding company of the Harley L. Clarke system. It has installed its own directors and dropped Mr. Clarke from the presidency. The R.F.C. says this action was necessary to safeguard its loan to the old Central Republic Bank & Trust Company. Stock representing voting control of P.U.S. Corporation was posted with this Dawes bank as security for a loan of $2,000,000 and the bank, in turn, pledged this stock as part of the collateral for its $90,000,000 R.F.C. loan.

This utility is a super-holding company of the type that is the target for anti-holding company legislation. It is the top of a pyramid. It controls properties widely separated geographically in this country and also important utilities in England. Some 50 subsidiaries give gas, water, electric and heat service to 1,082 communities, 570 in this country and 503 in England. Assets are more than $400,000,000. This holding company now goes over to what is practically government ownership on account of a $2,000,000 loan. This holding company is now under federal management. Will the R.F.C. apply all the provisions of the Wheeler-Rayburn bills and destroy its own assets as well as those of thousands of other investors? We doubt it.

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Power Policy Plays Politics

QUEER recommendations come from equally queer places. Thus the National Power Policy Committee lays down twelve points that would, if executed in the Rayburn bill, guillotine the holding company and leave its children fatherless and homeless. Every one had a different conception of the assignment given to that creature of the Administration. One expected that the government should show how to take the resources assembled by the Resources Board, weave them into the mosaic drafted by the Power Commission's power survey and correlate them with what private industry has already done and what government is struggling to do. The result would presumably be a masterly twenty-year program to make for a future generation the most of what we know, of what we have.

But no, the first blast from the Policy Committee is merely a timed vehicle for an equivocal executive message on the pending bill. An agency designed for one purpose is perverted to be merely another trumpeter in the band that is trying to break down the walls of Jericho so the pillagers can enter. This militant band, Trade, Power, Works and alphabetical, knows only one tune, and that is a vibrant anvil chorus. No matter from what trumpet it comes there must be regularity in the blares that are calculated to rock the foundations by their synchronized rhythm.

The proposals are not new—it is the same old score with variations. The music itself is not so terribly ear-splitting at a distance. It grates only because it is so monotonously themed and so booming. Possibly the inhabitants would come through their gate for a parley if the tune were more sympathetic and the accredited band leader stepped forward to speak for his crusaders.

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Investors Come Forward

BETWEEN November and March the value of utility equity securities on the New York Stock Exchange decreased a billion dollars. In this same period the average net earnings of the utilities improved appreciably and the business outlook for the future is promising. There is only one answer. Political attacks and proposed punitive legislation caused shrinkage in value. They undermined the confidence of investors who are unable to interpret current political happenings as other than destructive.

So serious was the situation that utility investors have made organized and individual protests. They seek a modification of the destructive bills in Congress. They seek to protect their savings from confiscation. These investors are numerous. They represent the most diversified and stable types of investors. It is estimated that the life insurance companies own a billion dollars of utility securities, the savings banks a half billion, commercial banks and trusts two billions and millions of individual investors at least three billions. These investors sought stable earnings when they put their money into these securities. They deserve a hearing.

But what happened? They are received with suspicion and their efforts are attacked with the same type of distortion and propaganda that is applied to the utilities. The endeavor is to frighten them and to discount their protests. These investors are aroused, however, and will not cease to fight against the confiscation of their savings. They can no longer be fooled. They know what the enemies of private ownership and self-seeking politicians are trying to accomplish. The voice of the utility investor is needed to get fair play for utilities. It will be heard.

Power Commission to Release National Power Survey

Interim report now on the press — Discusses existing power capacity as well as future demands and means of supplying them — A pioneer undertaking, says Vice-Chairman Basil Manly

There is general interest in the forthcoming interim report of the Federal Power Commission's National Power Survey, now in press and soon to be released. Devoting particular attention to future power demands and how they can be most economically and efficiently supplied, as well as to existing generating capacity and water powers capable of development, this survey is, as Vice-Chairman Basil Manly, commissioner-in-charge, points out, a pioneer undertaking—"the first engineering study of the electric light and power industry that has ever been made on a national scale in the U. S."

Major factors discussed in this initial report include: The development of electric power in the U. S. Power requirements upon resumption of pre-depression industrial activity. The adequacy of present power production facilities. The surplus and deficit of dependable capacity in each major zone. The power plants recently completed, or at present under construction. The value of co-ordination in a regional power supply. Undeveloped water power. Fuel resources. The relation of water and fuel-generated power. Interstate transfers of power. The importance of power in the national defense.

Survey includes 215 systems

Results and summaries are based largely on the returns of the 215 largest utility systems, comprising 391 properties privately owned, and 21 major municipal plants, which together represent 93 per cent of the country's generating capacity and 96 per cent of its total output.

The survey not only includes an examination of the water resources of the country as they relate to the conservation, development, control and utilization of water power (as specifically authorized by the August 19, 1933, Executive Order of the President), but also adds general estimates of the power requirements of the country and a study of the economic relation between water power and power obtained from fuel-fired plants.

Executives and engineers will be especially interested in the discussion and the estimates of the additional facilities necessary to meet future power demands, and the type of those extensions, whether fuel or water power, best suited to meet the character of the load.

Numerous tables will cover not only installed capacity in major plants, annual production, consumption and sales of current, but also the following: Production of electrical energy and maximum demands in 1929 and annual requirements upon resumption of pre-depression industrial activity; capacity of domestic electric appliances added since 1929; installed and dependable capacity of major private, municipal and public district power plants; present plant capacity of major utilities, classified according to year of installation and type of prime movers; capacity of steam station generators, classified according to age and size of units; steam station capacity and output, classified according to efficiency of plants at 60 per cent load; excess and shortage of capacity by power regions upon resumption of pre-depression industrial activity. The estimated capacity and estimated annual output of undeveloped water power in the U. S. as compared with the 1929 power production and the 1934 installed capacity of the 215 major electric utilities which together produce all but about 4 per cent of the country's electrical energy.

Maps and charts will show: Power zones, generating stations with annual outputs of more than 100,000,000 kw-hr., principal generating stations and transmission lines, installed capacity of generating stations by years, annual and average consumption of residential customers, the year of installation of capacity and maximum turbine efficiencies by years, the cumulative total of installed capacity at present available for service, the trends in fuel consumption, the shortage and surplus of generating capacity based on existing facilities with normal reserves, the locale of undeveloped water-power areas and their relation to metropolitan load centers, the annual production of electrical energy for public use, 1887 to 1934, coal fields, oil and gas fields, principal pipe lines, the production of these three fuels by states, the per cent of farms served by central stations.

The survey places the "dependable" capacity of the 215 systems' plants analyzed at 27,300,000 kw., or 14 per cent less than their installed capacity. With a resumption of pre-depression industrial activities, it is estimated that several million kilowatts of capacity may need to be replaced.

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Illinois Frees Insulls

Illinois dropped its embezzlement charges against Samuel Insull and his brother, Martin, last week when Judge Cornelius J. Harrington of the Cook County Criminal Court granted the motion of John O'Hora, Assistant State's Attorney, to nol-pros the remaining embezzlement cases against them. Attorney O'Hora had prosecuted both in separate trials before Criminal Court juries which acquitted them.

In the meantime, the suit against five banks in New York City and the General Electric Company in behalf of Insull Utility Investments Corporation debenture holders (ELECTRICAL WORLD, March 16, page 42), continues, with bank officials denying any knowledge of a debenture covenant limiting Samuel Insull's borrowing.

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Federal Action Asked Against New River Project

Action has been taken by the Federal Power Commission requesting the Attorney-General to institute a suit in the name of the United States to require the Appalachian Electric Power Company to secure a license from the commission for its $11,000,000 project on New River, near Radford, Va., construction of which has been begun by the company.

Both the commission and the War Department have held that the necessary regulations for the protection of navigation must be prescribed through a license to be issued by the commission for the construction and operation of the project. The project was the subject of litigation in 1931, 1932 and 1933, in which the company sought but failed to have the Federal Water Power Act declared unconstitutional. "The company lost this suit," Chairman Frank R.

McNinch of the commission stated, "in all three courts. . . Having been defeated in its attempt to evade federal jurisdiction and regulation, the company is going ahead with the construction of this project without a license. . ."

Another New River project, the Hawks Nest development, was again brought up for court action, when the State of West Virginia and the corporations seeking to establish the project, the Union Carbide & Carbon Corporation of New York, and its subsidiaries, the Electro-Metallurgical Company and the New-Kanawha Power Company, filed on March 15 motion papers with the U. S. Supreme Court seeking dismissal of the government's injunction suit against them. The government contends no federal license was obtained.

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Employment Stabilization Advocated by Swope

In a radio address broadcast last week, President Gerard Swope of the General Electric Company discussed the distinct advantages of employee participation in any state or national unemployment insurance plan, and the encouragement of employers to experiment with stabilization of employment in their industries. Speaking on "Economic Security," Mr. Swope selected these two phases of the program now being considered by Congress, criticising any plan which called for employer contributions alone as a payroll tax which should not be confused with the provision of real economic security for the workmen. "Every encouragement and incentive should be given the employer to stabilize employment, which to my mind is even more important than unemployment compensation and employee contributions," Mr. Swope said. "Very little has been done in this country, or any other country, for encouraging greater stabilization of employment." Efficient employers, he also declared, could not be expected to be enthusiastic over any plan of stabilization of employment which taxed them for the shortcomings of other industries or employers.

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Electrical Show in Fall

Announcement has been made by Clarence L. Law, president of the Electrical Association of New York, that the 1935 National Electrical and Radio Exposition will be held in New York City from September 18 to 28 inclusive at Grand Central Palace, under the sponsorship, as in previous years, of the association. Particular attention was directed by Mr. Law to proposed show features announced as the Halls of Science. These will graphically depict "A Review of Progress" and "A Pageant of Achievement."

RFC Assumes Control of Huge Clarke Unit

Takes action to protect Dawes bank loan — Control of whole Clarke system a possibility — Assets of $406,000,000 involved in Utilities Power & Light

Eclipse of another commanding figure in the public utility field, Harley L. Clarke of Chicago, was indicated by the Reconstruction Finance Corporation's seizure last week of control in the Public Utilities Securities Corporation, key holding unit in the Clarke system. A few years ago, Mr. Clarke stood second only to Samuel Insull as a factor in the utilities of the Middle West. He has now been dropped from the presidency of his top holding company and the RFC has installed its own group of directors.

It has been indicated by RFC officials that the Clarke management of the Utilities Power & Light Corporation will be removed when stockholders of the corporation hold their annual meeting April 24 in Richmond, Va.

Management of the Clarke holding company was assumed by the RFC on the ground that the action was necessary to safeguard RFC's loan to the old Dawes bank, the Central Republic Bank and Trust Company. Stock representing voting control in the Public Utilities Securities Corporation was posted by the company with the Dawes bank as security for a loan of $2,000,000.

The Dawes bank in turn pledged the stock with the RFC as part of the collateral for the $90,000,000 loan it obtained in 1932. Through its holdings in the parent company the RFC is in a position to exercise control of management in the vast underlying properties of the system.

The Securities Corporation is a superholding company, controlling the Utilities Power & Light Corporation, which owns controlling interest in a number of subsidiaries, including the Laclede Gas Light Company of St. Louis. Utilities Power & Light also has important holdings in England. It holds direct control of fifty subsidiary companies, some of which in turn control other utility properties. The properties supply electric, gas, water and heat service in 570 communities in this country and in 503 through the English companies. Total assets of Utilities Power & Light were reported in the last published statement in excess of $406,000,000.

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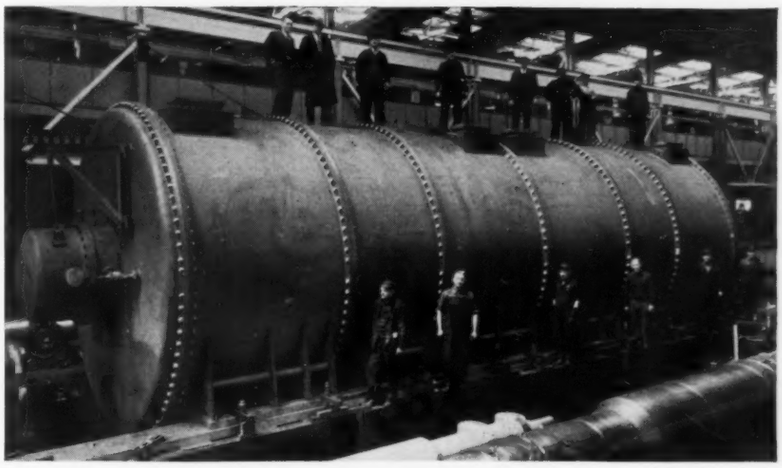
Engineering Societies to Hold Joint Dinner Meeting

Officers and directors of the national societies of electrical, civil, mining and metallurgical and mechanical engineers, and of their several jointly sponsored functional organizations will all meet together for dinner Monday, May 20, at the Engineers' Club in New York, according to plans recently announced by United Engineering Trustees, Inc., acting for the societies in sponsoring the proposed meeting. This is the first time in the history of the engineering societies that any such meeting has been undertaken and it is considered to be an important and significant step toward the establishment of a broader and clearer understanding of their joint work.

HYDROGEN-COOLED FREQUENCY CHANGER



General Electric

This frequency changer, the first to operate in an atmosphere of hydrogen, will be installed in the Freemansburg, Pa., substation of the Pennsylvania Power & Light Corporation. It will convert 60-cycle to 25-cycle power for use in the Bethlehem Steel Company's plant at Bethlehem, Pa. The generator of the set is rated at 22,222 kva., 6,900 volts.

Public Utility Executives Assail Wheeler-Rayburn Measure

Vigorous rebuttal testimony presented by holding company representatives to interstate and foreign commerce committee — Services by holding companies outlined — Economist calls bill threat to recovery

While the hearings on the Wheeler-Rayburn holding company bill have been in progress since February 19, when Dr. W. M. Splawn opened the testimony on behalf of the government, it was not until a month later that the holding companies themselves had an opportunity to commence their own defense.

The March 14 session of the House interstate and foreign commerce committee heard as the first of the utility spokesmen President Wendell L. Willkie of the Commonwealth & Southern Corporation. "The elimination of the holding company," said Mr. Willkie, "will destroy the very instrumentality by which the use of electricity has been made dependable, economical and efficient, and more widespread in this country than in any other in the world. Its deflationary effects will be felt for years. If we knew tomorrow morning that the questions which this bill raises were equitably disposed of," Mr. Willkie continued, "we could authorize the doubling of our capital expenditures and put thousands of men to work. We could then again attract capital, build properties, enlarge our business activities and contribute greatly to the restoration of prosperity in this country."

Following Mr. Willkie, Preston S. Arkwright, president of the Georgia Power Company, pointed out that in his opinion the passage of the holding company legislation would immediately curb and eventually destroy all state regulation of electric utilities. Abolishing the holding company, protested Mr. Arkwright, wouldn't put the ownership of operating companies into local hands. On the contrary, it would simply put them into the hands of the bankers, the bankruptcy courts, or the federal government. Referring to the provisions of the bill covering operating companies, Mr. Arkwright stated that the proposed federal regulation of these companies was so drastic that few of them could survive.

President John E. Zimmermann of the United Gas Improvement Company, together with Vice-President W. W. Bodine of the same company, demonstrated by chart the complications involved in dissolving his holding company's structure and distributing the holdings of stock in subsidiaries and other utilities pro rata among U.G.I.'s stockholders. Directly addressing the House committee, Mr. Zimmermann answered each of the thirteen charges of alleged abuses stated.

President Charles W. Kellogg of the Engineers Public Service Company, a subsidiary of Stone & Webster, took the stand to testify. "Experience since the earliest days of the business," said Mr. Kellogg, "has demonstrated that, except in the largest population centers, it is quite impossible to raise locally the new capital constantly being required for the extension of the electric utility's facilities and also that none except the large companies can afford to employ the talent required for the best service." Citing the development of an integrated system serving an area of some 10,000 square miles in Virginia and northern North Carolina by his company, Mr. Kellogg insisted that if the provision in the Wheeler-Rayburn bill requiring geographic integration were literally applied, it would not only break up the system of centralized supervision of his organization, but would ignore entirely the stabilizing effect of the diversity in climatic and business conditions.

Vice-president Edmund W. Wakelee of the Public Service Corporation of New Jersey also testified before the committee. Although his company is essentially intrastate in character and was specifically mentioned by Dr. W. M. Splawn as one of the companies "ideal for the realization of the economies of unified management," the holding company bill would call for its dissolution, said Mr. Wakelee. "If, after consideration," Mr. Wakelee continued, "the committee determines that some federal regulatory legislation is necessary, such legislation should not superimpose federal management on top of state regulation; but should be confined, first, to a definition of the evils which it may be desirable to take out of holding companies, and second, such prohibition and regulation as will adequately accomplish the desired result."

An economist, Dr. David Friday, followed Mr. Wakelee as a witness. Emphasizing that the Wheeler-Rayburn bill has already seriously depressed the market for utility stocks and bonds, and has had a similar effect upon business activity in general, Dr. Friday indicated it as his opinion that if any one had deliberately started out with malice aforethought to destroy the immediate prospects of further business revival he could hardly have done it more effectively than it has been done unwittingly.

Loss of $133,000,000 by common-stock holders in his North American Company alone and further shrinkage in all utility common stocks were predicted by President James F. Fogarty if the pending legislation is enacted. "It is apparent," Mr. Fogarty said, "that if widespread enforced liquidation becomes a reality, the market prices of all utility common stocks would shrink materially and a further shrinkage of less than 25 per cent in the realization on our investments would wipe out entirely the $216,000,000 of present asset value of North American common stock."

Characterizing parts of the bill as "impractical," "impossible" and "silly," Clyde Reed of Kansas, former Governor and chairman of the State Utility Commission, assumed the committee would "substantially and materially" modify the measure. Both Mr. Reed and Samuel Ferguson, chairman of the Hartford Electric Light Company, condemned the provision that power lines, electric and gas shall be considered common carriers.

Harris & Ewing

Wendell L. Willkie (left) and Preston S. Arkwright, who launched the sharp attack against the pending public utility bill.

T.V.A. Power Plan to Be Continued

Directors announce program after consulting President Roosevelt — May purchase Tennessee Electric Power's Chattanooga system — Tennessee Public Service obtains injunction

Determination to proceed with the Tennessee Valley Authority's power program, notwithstanding legal obstacles, was voiced by the Authority directors last week after a talk with President Roosevelt. All three directors were present for the first time in many months, but both Arthur E. Morgan, chairman, and David E. Lilienthal, director, declined to discuss the purpose of their visit, saying only that the power program will be continued and that they reported progress to the President in the economic and social experiment in the Valley.

Meanwhile on Capitol Hill, a three-barreled attack was launched against any future federal court injunction which might seek to interfere with the T. V. A. Bills were introduced by Senator Norris of Nebraska, author of the T. V. A. act, and Senator Black of Alabama, to make the government power program "airtight." Senator Norris offered bills to require persons seeking to enjoin the Authority to post bond covering all damages which may be sustained from any delay, in event the injunction finally was denied, and also providing definite means for assisting cities in financing their own distribution systems. Senator Black sought in another measure to carry cases involving restraint against federal law direct to the Supreme Court, without going through the Appellate Court, and his bill provided that once in the Supreme Court such cases shall take precedence over all other cases not of a like nature.

T. V. A. plans for Chattanooga

Mr. Lilienthal recently stated that the city of Chattanooga, which approved a bond issue of $8,000,000 on March 12 to finance a public power distribution system with T. V. A. energy (ELECTRICAL WORLD, March 16, page 39), could be furnished T. V. A. energy without erection of a municipal power system financed by city bonds. Passage of the McSwain amendment, he said, would enable the authority to finance the purchase of an electric system by the city. He disclosed that the Authority was contemplating a policy by which it would seek to purchase from the Tennessee Electric Power Company its generating properties as well as its distribution system in Chattanooga. Speaking of the bill introduced by Congressman McSwain of South Carolina, which seeks to amend the T. V. A. act, Mr. Lilienthal said its passage would assure construction of a dam between Knoxville and Chattanooga; would expressly allow unified power development and a 9-foot channel in the Tennessee River from Knoxville to Paducah; and would erase the effect of Federal Judge W. I. Grubb's recent decision, in Birmingham, restraining the Authority's sale of surplus power.

Charging the city of Knoxville with entering into "unlawful competition" with its business, the Tennessee Public Service Company obtained this week a temporary injunction halting work on the city's new municipal power distribution system. The injunction also restrains the city from obtaining further funds from the Public Works Administration or any other source for use in building the municipal system, and from delivering the city's bonds to P. W. A.

Power earnings reported

Operating and financial results for 1934 of the distribution of electricity under T. V. A. rates in Tupelo, Miss., Athens, Ala., and Alcorn County, Miss., have been reported by Edward Falck, rate engineer of the Authority. For the eleven months ended December 31, 1934, gross operating revenue from operations in Tupelo amounted to $79,240; after total operating expenses, including taxes and depreciation, net operating revenue was $29,236 and balance to surplus was $20,955. In Athens operations showed gross operating revenue of $19,628, net revenue $5,667 and balance to surplus $3,335. Alcorn County reported gross operating revenue of $45,128; net operating revenue of $19,005 and balance to surplus of $17,084.

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Pacific Gas Issue Offered

The new issue of Pacific Gas & Electric Company first and refunding mortgage 4 per cent bonds, totaling $45,000,000 (ELECTRICAL WORLD, March 16, page 44), was placed on the market this week priced at par and accrued interest.

COMING MEETINGS

Florida Engineering Society — Annual meeting, Miami, Florida, April 4-6. W. W. Fineren, secretary, Engineering Building, Gainesville, Fla.

American Institute of Electrical Engineers—Southwest District, Oklahoma City, Okla., April 24-26. H. H. Henline, national secretary, 33 West 39th Street, New York.

Missouri Association of Public Utilities —Annual meeting, Kansas City, Mo., April 25-26. Jesse Blythe, assistant secretary, 101 West High Street, Jefferson City, Mo.

American Physical Society — Annual meeting, Washington, D. C., April 25-27. H. W. Webb, acting secretary, Columbia University, New York, N. Y.

National Electrical Manufacturers Association — Spring meeting, The Homestead, Hot Springs, Va., May 20-23. W. J. Donald, 155 East 44th Street, New York.

Appliance Sales Mount Rapidly

Dealers and utilities exceed budget expectations — Ranges and water heaters actively promoted — All regions report increased sales

A test check by ELECTRICAL WORLD on appliance sales to date in the several sections of the country show an active market and sales, in general, much larger than budget expectations. The data cover January and February and, in some cases, the first fifteen days of March. Practically all report dealers, distributors and utilities are enjoying a large increase in appliance business. Special emphasis is being put on washers, refrigerators, lighting, ranges and water heaters. As a sample of the utility merchandising conditions typical of those obtaining for all sales outlets the following table is indicative:

	Actual Sales So Far This Year Compared to Same Period Last Year, Per Cent	Budgeted Sales for the Year 1935 Over Sales for 1934, Per Cent	Geographical Region
1.	34	15	East
2.	44	25	West
3.	200	26	West
4.	20	7	East
5.	18	19	Central
6.	6.5	40	East
7.	12	12	East
8.	9	13	West
9.	36	20	West
10.	33	50	West
11.*	12	250	South
12.	58	25	West
13.	—0.5	5	East
14.	1	14	West
15.	7	8	East
16.	46	25	Central
17.	33	45	South
18.	41	35	West
19.*	90	100	Central
20.	42	25	Central
21.	25	25	Central
22.	143	10	South
23.	14	15	South
24.	24	20	West
25.	40	35	Central
26.	36	50	East

*Ranges and water heaters only.

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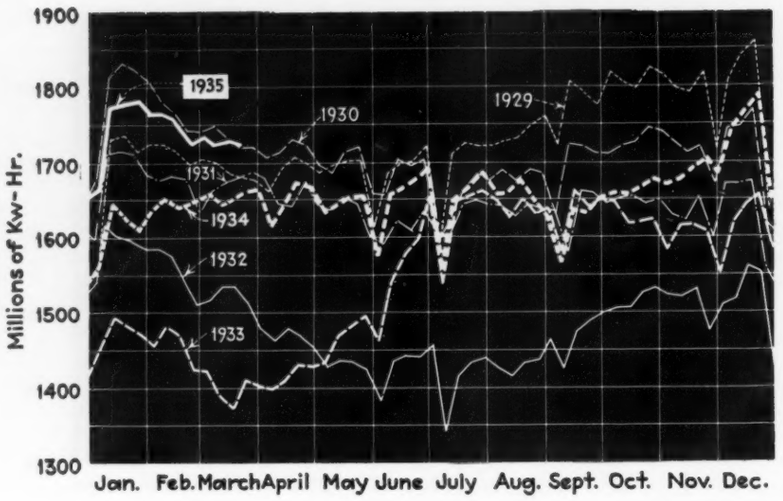
P.W.A. State Bills Vetoed

Veto by Gov. Charles H. Martin of Oregon of the so-called Ickes-Grange Power bill ended the hectic career of that measure in its course through the state Legislature, just adjourned. Starting out as a House bill after much working over in committee, it went to the Senate, where it was rewritten and passed as a Senate bill, reaching the House again to be passed in the closing hours of the session, and finally coming to the Governor's desk after adjournment. The bill provided for an elective commission of three, having broad powers to build transmission lines, condemn power properties and issue revenue bonds.

Governor Tom Berry of South Dakota also vetoed one of the electric power bills submitted by the Federal Public Works Administration and adopted by the state Legislature before it recently adjourned.

Output Sets New Record



All-time records of energy output for the third week in March were broken when the production last week slightly overshot that of the corresponding period of 1930, with a margin of 4 per cent over 1934. The prospective need of new construction to take care of next winter's peak, at least in some localities, seems to be definitely indicated. As announced by the Edison Electric Institute, central stations generated 1,724,763,000 kw.-hr. during the week ended March 23, compared with 1,728,322,000 in the preceding week.

Weekly Output, Millions of Kw.-Hr.

1935	1934	1933
Mar. 23...1,725	Mar. 24...1,658	Mar. 25...1,410
Mar. 16...1,728	Mar. 17...1,650	Mar. 18...1,375
Mar. 9...1,724	Mar. 10...1,647	Mar. 11...1,391
Mar. 2...1,734	Mar. 3...1,658	Mar. 4...1,423
Feb. 23...1,728	Feb. 24...1,646	Feb. 25...1,426
Feb. 16...1,761	Feb. 17...1,641	Feb. 18...1,470

Demand for industrial power has not only been sustained but is increasing. This is shown by the circumstance that energy consumption has held almost level for a month despite the decreasing use of light at this season.

Output in the Mountain states continues much greater than a year ago, with more modest gains in the chief industrial areas. The only loss occurred in the Pacific states.

Per Cent Change from Previous Year

Region	Week ended Mar. 23	Mar. 16	Mar.
New England	+ 1.8	+ 3.0	+ 4.9
Middle Atlantic	+ 1.9	+ 3.6	+ 2.5
Central Industrial	+ 4.1	+ 5.3	+ 4.9
West Central	+ 3.6	+ 4.9	+ 3.2
Southern States	+ 8.0	+ 6.9	+ 5.7
Rocky Mountain	+17.3	+16.5	+15.1
Pacific Coast	— 2.2	+ 0.4	+ 6.0
United States	+ 4.0	+ 4.7	+ 4.7

Lamp Prices Reduced by Three Manufacturers

Announcements have been made by the General Electric Company and the Westinghouse Lamp Company of substantial reductions, effective April 1, in the prices of incandescent lamps. Gerard Swope, president of General Electric, stated that the reduction averaged 21 per cent in the list price of 60 per cent of all large incandescent lamps and that the popular household types have been reduced from a retail price of 20 cents to 15 cents.

"We are making a reduction of over 20 per cent in the prices of lamps," D. S. Youngholm, vice-president of the Westinghouse Lamp Company, said, "comprising 60 per cent of our production." "Of greatest interest," he continued, "to the general public is the reduction applying to the common house lighting types in sizes from 15 to 60 watts which now sell for 20 cents but will be sold for 15 cents in the future. Corresponding reductions are being made on some of the larger sizes."

Edward J. Poor, chairman of the board of directors of Hygrade Sylvania Corporation of Salem, Mass., has announced a reduction in the prices of Hygrade incandescent lamp bulbs, effective April 1. The reductions average 25 per cent in the case of the common types of lamps—from 20 cents to 15 cents—but in addition these reductions apply also to a wide range of the special lamps used for street lighting, factory lighting, sign lighting, etc.

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El Paso Strike Ended

Peace in the El Paso, Tex., power strike, which affected cities in Texas, Mexico and New Mexico (ELECTRICAL WORLD, March 16, page 43) was assured with the signing on March 17 of an agreement effective for six months. The peace pact requires plant and distribution employees to deal directly with company management until September 15, 1935; permits employees to join a union, without discrimination; provides for creation of an arbitration board should company and employee wage and hour negotiations fail, and assures no strike or lockout during any period of negotiation or arbitration.

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Domestic Use Breaks Record

Energy consumption for domestic purposes in January broke all previous records by rising 5.9 per cent above last year's January to 1,316,743,000 kw.-hr., according to the Edison Electric Institute. Small commercial sales were close to the all-time record. Wholesale customers used 14.1 per cent more energy than a year ago. Total kilowatt-hour sales were the highest in five years and 9.4 per cent above January, 1934, whereas revenue increased only 5 per cent to $170,101,000. The latter was the largest monthly revenue since January, 1932. Meanwhile the twelve-month average domestic rate dropped further to 5.28 cents—the cheapest on record.

Because of the many reports required of cooperating companies by various governmental agencies, together with work in connection with pending legislation, the returns are still incomplete and the figures are subject to revision.

Publication of the usual detailed tabulation must be deferred until the next issue of ELECTRICAL WORLD.

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Weyerhaeuser Launches Separate Pole Company

The Weyerhaeusers have created a new subsidiary, Weyerhaeuser Pole Company. This new company will deal exclusively in the purchase, development and distribution of poles, piling and other round timber products—specializing in western red cedar. It is expected that the principal—although not exclusive—source of supply will be the operations of affiliated Weyerhaeuser concerns in the West. It will also take over and continue the operation of the several western red cedar yards and open tank butt-treating plants formerly owned by various Weyerhaeuser affiliated companies. The general sales office will be opened in Minneapolis April 1.

New York Metal Prices

	Mar. 13, 1935 Cents per Pound	Mar. 27, 1935 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.55	3.60
Antimony	14.25	14.50
Nickel ingot	35.00	35.00
Zinc, spot	4.25	4.25
Tin Straits	46.85	47.40
Aluminum, 99 per cent	19—21	19—21

*Blue Eagle.

Allis-Chalmers Cuts Loss in Best Year Since 1931

With an increase in bookings, billings and unfilled orders at the end of the year, the Allis-Chalmers Manufacturing Company reported this week a loss of $1,039,406 on operations in 1934, compared with a loss of $2,893,905 in 1933. Last year's business was the best since 1931, when the profit was $1,256,431.

Bookings totaled $21,875,009, compared with $14,270,941 in 1933, while billings rose to $20,287,148 from $13,286,768. Costs, however, were $21,390,138, against $16,156,929 in 1933. Unfilled orders on December 31 last aggregated $8,013,859, compared with $6,425,998 at the end of 1933. Current assets were $27,024,559 and current liabilities $3,974,836. At the end of 1933 the figures were $25,862,867 and $2,879,860, respectively.

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General Electric Profit Totaled $19,726,044

In its forty-third annual report issued this week the General Electric Company for the year 1934 shows profit available for dividends of $19,726,044, equivalent, after $2,575,074 of regular 6 per cent cash dividends on the special stock, to 59 cents a share on 28,845,927 shares of no par value common stock, compared with $13,429,739, or 38 cents a share on the same number of shares in 1933.

Regular cash dividends of 60 cents a share on both the special and common stock amounted to $19,881,453, resulting in a deficit from operations of $155,410, which was taken from surplus.

Orders received amounted to $183,660,303 during 1934, compared with $142,770,791 during 1933, an increase of 29 per cent. Sales billed amounted to $164,797,317 during 1934, compared with $136,637,268 during 1933, an increase of 21 per cent. The orders received exceeded the shipments by a substantial amount, so that unfilled orders were greater at the end than at the beginning of the year.

Current assets at the end of 1934 amounted to $177,269,050, including cash and marketable securities (valued at the lower of par or market) of $107,949,999, and current liabilities were $17,461,338.

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New York Courts to Rule on Municipal Plant Profits

New York courts will be asked to decide whether municipal power plant profits may be used to reduce taxes. The Light Commission of Boonville is prepared to protest a ruling by the State Public Service Commission against such use of profits. The commission ordered Boonville to cut its rates $15,000 yearly, effective April 1. The village protested that taxpayers receive substantial benefits in lower taxes as a result of the profitable operation of the power plant. Boonville's appeal will be framed about the commission's ruling that it is "against sound public policy" to accumulate profits from the operation of a municipal power plant to the extent that "such profits may be transferred to the village funds and used to pay taxes or promote other municipal projects."

Joining Boonville in the appeal will be the Municipal Electric Utilities Association, representing fifty-seven power plants in the State.

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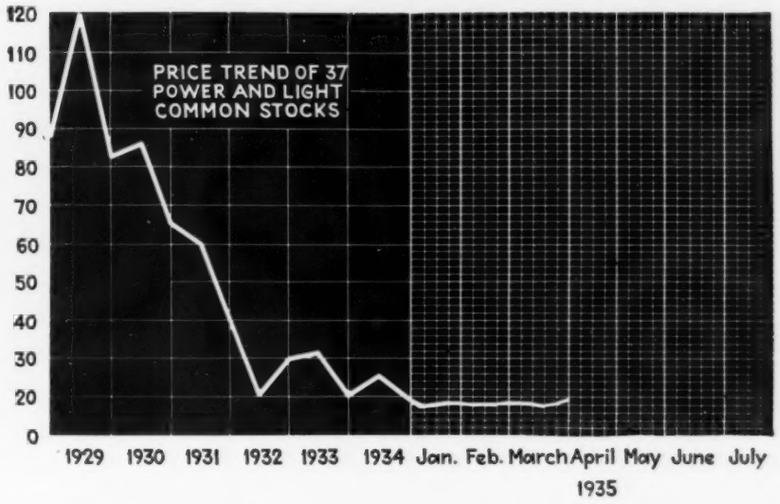
Common Dividend Increased

American Gas & Electric Company has declared a quarterly dividend of 35 cents a share on the common stock, payable April 1 to stockholders of record March 14. Previously the company paid 25 cents quarterly.

Light and Power Stocks Advance



Despite the drastic legislation which is pending in Washington, utility stocks are holding their ground. Price advances carried the "Electrical World" index to 19.1, the highest point since last December.

Current Earnings Reports

Operating Companies

	1935	1934
Detroit Edison (Year ended Feb. 28)		
Gross earnings	$45,657,219	$42,105,500
Net balance	5,448,658	6,574,077
Kansas City Pwr. & Lt. (Year ended Jan. 31)		
Gross earnings	14,831,339	14,267,192
Net balance	3,338,949*	3,219,414*
	1934	1933
Duquesne Light (Year ended Dec. 31)		
Gross earnings	$25,490,209†	$23,972,178
Net balance	8,839,788†	9,300,215
Louisville Gas & Elec. (Year ended Dec. 31)		
Gross earnings	10,023,927†	9,642,246
Net balance	1,474,497†	1,588,138
Milwaukee Elec. Ry. & Lt. (Year ended Dec. 31)		
Gross earnings	25,739,829	24,221,582
Net balance	53,892‡	30,897‡
Northern States Pwr. (Minn.) (Year ended Dec. 31)		
Gross earnings	28,073,974†	27,121,066
Net earnings	5,175,603*	5,764,175*
Puget Sound Pwr. & Lt. (Year ended Dec. 31)		
Gross earnings	13,224,060	12,599,281
Net earnings	1,372,094‡	1,295,783‡
Toledo Edison (Year ended Dec. 31)		
Gross earnings	9,124,502	8,644,420
Net balance	1,197,928	1,124,138
Virginia Elec. & Pwr. (Year ended Dec. 31)		
Gross earnings	15,147,330	14,648,481
Net balance	1,526,815	1,870,748

Holding Companies

	1934	1933
Electric Pwr. & Lt. & subs. (Year ended Dec. 31)		
Gross earnings	$74,607,364	$67,725,710
Net balance	190,860	2,126,251‡
Engineers Pub. Serv. & subs. (Year ended Dec. 31)		
Gross earnings	44,419,497	42,349,921
Net balance	1,211,667‡	946,899‡
National Pwr. & Lt. & subs. (Year ended Dec. 31)		
Gross earnings	71,723,032	68,366,601
Net balance	6,332,977	6,615,768
Northern States Pwr. (Del.) & subs. (Year ended Dec. 31)		
Gross earnings	32,171,056†	31,055,939
Net balance	123,520†	706,633
Philadelphia Co. & subs. (Year ended Dec. 31)		
Gross earnings	47,521,762†	45,418,120
Net balance	3,696,776†	1,643,509

*Available for all dividends. †Preliminary. ‡Deficit.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

MEN OF THE INDUSTRY

Public Service Appoints J. T. Barron Vice-President

Jacob T. Barron, general manager of the electric department of the Public Service Electric & Gas Company, Newark, N. J., has been named vice-president in charge of electric operation to succeed the late Edgar Allegaert. Mr. Barron also was elected a director of the underlying operating companies of Public Service in place of Mr. Allegaert.

J. T. Barron

MARION PENN, general superintendent of generation, succeeds Mr. Barron as general manager and WALKER L. CISLER, planning and installation engineer, becomes general superintendent of generation, in place of Mr. Penn.

Mr. Barron became identified with Public Service in 1907 when he entered the testing laboratory. Subsequently he was assigned to the construction department, was made chief operator of substations and generating stations in the central division and in 1910 was made superintendent of the central division in charge of generating stations, substations, transmission and distribution. Nine years later he was appointed general superintendent of production, the title being later changed to general superintendent of generation, and had charge of all electric power generation in Public Service. In 1926 he was made general manager, electric department.

Marion Penn

Mr. Penn joined Public Service staff in 1914 as assistant division superintendent in the central division. Subsequent positions included plant engineer in Newark, chief engineer at the Essex station and chief engineer at Marion station. After spending more than a year at Kearny he was promoted to general superintendent of generation.

Since affiliating himself with Public Service in 1922 Mr. Cisler has been connected with the electric department in Newark and with the Marion, Kearny and Paterson stations. He was made planning and installation engineer, electric department, in 1931.

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Dr. D. C. Jackson to Retire

Dr. Dugald C. Jackson, head of the electrical engineering department of the Massachusetts Institute of Technology since 1907, past-president of the A.I.E.E., and of the Society for the Promotion of Engineering Education, and from 1919 to 1930 senior partner in the engineering firm of Jackson & Moreland, Boston, has announced his retirement at the end of the present academic year.

In his long and distinguished career at "M.I.T." Dr. Jackson has established an extensive program of graduate research in close alliance with undergraduate teaching; in the creation of a system of co-operative engineering education involving alternate periods of paid industrial work and technical instruction, and in the provision of a curriculum for exceptionally able students. His consulting engineering service has embraced a wide range of American and international connections in the telephone, transportation, hydro-electric and public utility fields. He received the honorary degree of Doctor of Science from Columbia in 1932, is the holder of the Lamme medal of the S.P.E.E. and has served on numerous engineering boards and committees.

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► R. V. CLUTE has been named vice-president in charge of sales and distribution of the Weyerhaeuser Pole Company, recently organized, with headquarters in Minneapolis. Mr. Clute brings to his new executive position a broad background of lumber and pole experience, embracing a period of 25 years.

W. B. Head Named President of Oklahoma Utilities Group

W. B. Head, Jr., president of the Oklahoma Power & Water Company, Sand Springs, was elected president of the Oklahoma Utilities Association at its recent annual meeting. A Dartmouth graduate, Mr. Head has been associated with the Dallas Power & Light Company and the Texas Power & Light Company. He took over the duties of president of the Sand Springs utility in the fall of 1933.

W. B. Head

OBITUARY

► JOHN I. NEWELL, vice-president of the British Columbia Electric Railway Company, Ltd., died in Vancouver February 3, following an illness of three days. Mr. Newell was identified with the British Columbia utility for 28 years. An electrical engineer, he was prominently connected with the company's early construction work. In 1916 he was made superintendent of electrical construction and two years later electrical superintendent. It was in 1929 that he was appointed to the vice-presidency.

► WILLIAM S. ELLIOTT, president of the Elliott Company, Pittsburgh, Pa., died suddenly, February 21, in his seventy-second year. A pioneer manufacturer in the Pittsburgh district, Mr. Elliott founded the Liberty Manufacturing Company to manufacture boiler tube cleaners in 1901 and when the business expanded he later incorporated the Elliott Company, broadening his manufacturing interests with a line of power plant accessories.